

UNITED STATES NAVAL OBSERVATORY

ERRATA

CIRCULAR NO. 170

Page 7: In the hours column, the values 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60 are incorrect. The correct values are:

U. S. Naval Observatory, Washington, D. C. 20390

November 7, 1986

Page 9: On two column headings for "h m s" read "d h m." Then, in the days and hours columns, correct values are:

SOLAR ECLIPSES, 1991--2000

2 92	for 6 12 read 30 12
3 92	for 0 00 read 24 00
1 95	for 3 17 read 29 17
2 95	for 0 04 read 24 04
1 98	for 3 17 read 26 17
3 00	for 7 02 read 31 02
4 00	for 1 17 read 25 17

by

Pages 10, 39: The word "Eclipse," which appears in the top margin of page 39, belongs in the map on page 10, near the upper right hand corner, just inside the heavy-lined curve to be labeled "Eclipse Begins at Sunset."

Alan D. Fiala

James A. DeYoung

and

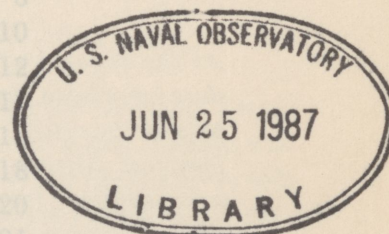
Marie R. Lukac

USNO Circular No. 170: Solar Eclipses, 1991-2000

ERRATA

Page 7: In the hours column of Right Ascension, several numbers are incorrect. The correct values are:

ID	Hour
3 92	18
2 93	15
2 94	14
2 95	13
2 96	13
2 97	10
2 98	10
4 00	18



Page 9: On two column headings for "h m s" read "d h m." Then, in the days and hours columns, correct values are:

ID	Day and Hour
2 92	for 6 12 read 30 12
3 92	for 0 00 read 24 00
1 95	for 5 17 read 29 17
2 95	for 0 04 read 24 04
1 98	for 2 17 read 26 17
3 00	for 7 02 read 31 02
4 00	for 1 17 read 25 17

Pages 10, 39: The word "Eclipse," which appears in the top margin of page 39, belongs on the map on page 10, near the upper right hand corner, just inside the heavy-lined curve to be labeled "Eclipse Begins at Sunset."

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INTRODUCTION

At the request of Commission 13 of the International Astronomical Union, these data have been specially calculated in the Office of the American Ephemeris, from tabular positions of the Sun and Moon computed for the purpose in the British Nautical Almanac Office. The aim is to provide the location of tracks of total solar eclipses far enough in advance so that in regions where extended meteorological observations are lacking, suitable sites for eclipse expeditions can be determined. It is intended to issue this information as rapidly as it can be prepared, until it is eight years in advance, after which it will be issued annually.

—U. S. Naval Observatory Circular No. 1, July 18, 1949.

More than 37 years have passed since that brave declaration started this series of Circulars. These Circulars contain astronomical data, resulting from continuing programs, which usually are not available in any other publication. In the first 10 years, 87 Circulars were published, of which seven (Nos. 1, 2, 16, 40, 53, 59, and 85) presented the information necessary to achieve the goal of getting eight years ahead. From 1955 on, all types of solar eclipses were included. In the 1960's, the pace slowed, but the eight-year minimum lead was maintained. Three more Circulars (Nos. 89, 101, and 113) containing long-range predictions were published, and with the appearance of No. 113, on December 15, 1966, the advance lead reached 14 years, through 1980. The only other such Circular since then was No. 142, "Solar Eclipses, 1981–1990", dated April 20, 1973. Thus in 24 years, predictions for approximately seven dozen eclipses during four decades had appeared. Producing just the most essential numerical data was no small effort, as most of it was done using desktop calculators or the earliest of punched card equipment and programmable computers.

In these nearly forty years, the organization of the astronomical community and its operating milieu, which were the context of the introductory quotation, have changed extensively. Commission 13 (Solar Eclipses) became Commission 12a, then a Working Group. The theoretical basis of the ephemerides and the adopted constants have been improved. Computational methods have advanced from mechanical calculators to enormously powerful electronic computers. Weather conditions globally are routinely monitored and recorded. Observational methods have expanded from ground to space, from visual wavelengths to the entire spectrum. The ease of producing more detailed and precise predictions more quickly has raised the expectations of the users, but at the same time increased difficulties in getting the information into print. Funds for eclipse expeditions are difficult to obtain, yet the increased ease of travel has broadened interest in observing eclipses internationally. The identification, evaluation, and choice of sites with the best weather prospects is still of great importance, and long-range planning for travel and accommodations is imperative. Hence, there is still a demand for predictions far in advance.

This Circular continues the long-range predictions to the end of the current millenium. In the concluding decade, there will be 23 eclipses of the Sun, of which 13 will be central and 10 partial. Of the central eclipses, 7 will be total, 6 annular.

This Circular has several important changes from the previous ones of its kind:

1. A map is included for each solar eclipse. The scale is the same for all maps. To reduce the labor of production, as compared to the annual publication maps, shading was omitted, and the labels are fewer. The curve for maximum eclipse on the horizon was left unlabelled, as was the point of maximum eclipse for partials. The dashed curves of the outline of the penumbra are given only for integral hours.

2. East longitude is positive, following the convention adopted by the International Astronomical Union in 1982. Longitude is labelled around the outside of the map.

3. All times are provisional Universal Time. Previous Circulars in this group used Ephemeris Time (now replaced by Dynamic Time). The difference between the two is now approaching one minute, and it was judged that for planning purposes users would prefer to make a small adjustment for a better value later on, if necessary, than to make a large adjustment all the time.

Dates refer to the Universal Time of the eclipse. Eclipses listed for two consecutive dates will begin on the first and continue over to the second by Universal Time. Care must be taken to get the correct date when using data from the tables on pp. 6-9, when reading times from maps, and when applying time zone corrections. Keep in mind that the eclipse shadow always moves from west to east, and consecutive phenomena are at smoothly increasing times, within a total time span of about six hours or less.

4. The assumed correction to Universal Time, the Elements of Conjunction, and the General Circumstances, which would appear in the *Astronomical Almanac*, are included in tabular form on pages 6-9. Each eclipse has a 3-digit identification code. The second and third digits give the year, the first digit is the sequence during that year. For example, ID Code 295 refers to the second solar eclipse of 1995.

This Circular is for long-range planning only. The regular annual predictions will still appear in *Astronomical Phenomena* and the *Astronomical Almanac*. Special Circulars for individual eclipses will still be prepared according to the guidelines of Nautical Almanac Office policy. Therefore, Besselian Elements are not included, nor multiple forms of the path listing. For central eclipses, coordinates of the path and duration on the central line are given strictly at a 5-minute interval. Instructions on how to apply subsequent Universal Time corrections may be found in the annual publications; details of interpreting the maps likewise.

ELEMENTS OF ECLIPSES

ID	Type	Date of Conjunction	Conjunction UT			Conjunction	TDT- UT 1	Equat. Hor. Par.		True semi-diam.				
			h	m	s	JD No.		Sun	Moon		Sun		Moon	
						2400000.0 +			s	"	'	"	'	"
1 91	A	1991 01 15	23	43	30.177	48272.4885437	58	8.94	54	37.58	16	15.5	14	53.1
2 91	T	1991 07 11	19	06	08.116	48449.2959273	58	8.65	61	17.72	15	43.9	16	42.2
1 92	A	1992 01 04	23	14	43.499	48626.4685590	58	8.94	54	02.75	16	15.9	14	43.6
2 92	T	1992 06 30	12	23	22.989	48804.0162383	58	8.65	60	29.24	15	43.9	16	28.9
3 92	P	1992 12 24	00	45	09.177	48980.5313562	58	8.94	56	00.29	16	15.6	15	15.7
1 93	P	1993 05 21	14	33	44.841	49129.1067690	59	8.69	56	02.85	15	48.0	15'	16.4
2 93	P	1993 11 13	22	03	10.851	49305.4188756	59	8.89	60	35.50	16	09.9	16	30.7
1 94	A	1994 05 10	17	19	50.659	49483.2221141	59	8.71	54	04.40	15	50.2	14	44.1
2 94	T	1994 11 03	13	47	07.881	49660.0743968	59	8.87	61	21.11	16	07.4	16	43.1
1 95	A	1995 04 29	17	23	14.986	49837.2244790	60	8.73	54	34.01	15	52.8	14	52.2
2 95	T	1995 10 24	04	22	31.380	50014.6823076	60	8.84	59	20.16	16	04.7	16	10.1
1 96	P	1996 04 17	22	05	04.438	50191.4201903	60	8.76	57	13.74	15	55.6	15	35.7
2 96	P	1996 10 12	13	23	52.198	50369.0582430	60	8.81	56	08.68	16	01.7	15	18.0
1 97	T	1997 03 09	01	53	37.904	50516.5789109	61	8.86	61	12.57	16	06.5	16	40.8
2 97	P	1997 09 02	00	40	03.540	50693.5278187	61	8.72	53	58.65	15	51.1	14	42.5
1 98	T	1998 02 26	17	35	37.841	50871.2330769	61	8.88	60	52.71	16	09.1	16	35.3
2 98	A	1998 08 22	02	14	03.340	51047.5930942	61	8.69	55	38.50	15	48.7	15	09.7
1 99	A	1999 02 16	06	20	23.099	51225.7641562	61	8.90	58	08.86	16	11.4	15	50.7
2 99	T	1999 08 11	10	51	13.908	51401.9522443	62	8.68	58	44.53	15	46.8	16	00.4
1 00	P	2000 02 05	12	19	50.668	51580.0137809	62	8.92	55	07.60	16	13.3	15	01.3
2 00	P	2000 07 01	19	30	06.163	51727.3125713	62	8.65	61	21.44	15	43.8	16	43.2
3 00	P	2000 07 31	01	52	04.616	51756.5778312	62	8.66	61	05.71	15	45.3	16	38.9
4 00	P	2000 12 25	17	25	57.734	51904.2263627	62	8.94	54	22.92	16	15.7	14	49.1

ELEMENTS OF ECLIPSES

ID	Right Ascension			Hourly Motion		Declination			Hrly Mot'n		Declination			Hrly Mot'n	
	Sun and Moon			Sun	Moon	Sun			Sun		Moon			Moon	
	h	m	s	s	s	°	'	"	'	"	°	'	"	'	"
1 91	19	49	09.501	10.736	125.389	-21	04	25.58	+ 0	27.88	-21	19	54.65	+08	15.61
2 91	07	22	12.791	10.196	159.902	+22	05	48.50	- 0	19.99	+22	05	32.75	-08	46.34
1 92	19	00	11.850	10.995	126.011	-22	43	10.39	+ 0	15.80	-22	20	39.72	+05	46.57
2 92	06	38	57.402	10.350	158.436	+23	08	17.09	- 0	09.63	+22	22	19.96	-05	51.42
3 92	08	10	44.453	11.104	137.162	-23	25	00.08	+ 0	02.85	-22	24	45.87	+03	28.17
1 93	03	53	32.177	10.032	136.094	+20	15	51.72	+ 0	30.09	+21	19	49.89	+03	49.21
2 93	05	16	29.895	10.234	155.341	-18	09	00.13	- 0	39.32	-19	12	49.49	-06	24.42
1 94	03	09	28.516	9.772	123.007	+17	41	26.97	+ 0	39.06	+18	03	45.81	+05	20.24
2 94	04	33	57.140	9.863	154.334	-15	05	57.41	- 0	46.79	-15	28	02.14	-08	28.98
1 95	02	26	10.397	9.512	121.483	+14	28	26.20	+ 0	46.58	+14	09	33.18	+06	59.40
2 95	03	52	43.813	9.525	140.582	-11	34	15.75	- 0	52.39	-11	12	43.61	-09	23.86
1 96	01	44	38.729	9.298	129.997	+10	49	15.12	+ 0	52.35	+09	46	38.60	+09	01.49
2 96	03	11	58.580	9.248	123.326	-07	37	39.77	- 0	56.18	-06	32	02.59	-09	23.77
1 97	23	17	50.707	9.233	144.875	-04	32	00.05	+ 0	58.65	-03	33	13.40	+11	36.79
2 97	00	44	36.906	9.059	114.192	+07	58	17.78	- 0	54.67	+07	00	11.13	-08	36.60
1 98	22	38	20.058	9.436	145.571	-08	35	58.29	+ 0	56.21	-08	20	51.27	+10	43.75
2 98	00	03	47.075	9.233	124.082	+11	53	19.55	- 0	50.25	+11	38	09.28	-08	10.72
1 99	21	57	18.887	9.722	136.317	-12	28	11.50	+ 0	51.83	-12	56	29.22	+08	44.34
2 99	09	23	06.422	9.467	142.077	+15	19	48.51	- 0	44.35	+15	50	09.66	-07	41.61
1 00	21	13	50.062	10.075	126.479	-16	02	23.21	+ 0	45.28	-17	11	04.84	+06	30.46
2 00	06	44	33.854	10.335	164.223	+23	02	33.58	- 0	10.99	+21	44	03.30	+00	28.19
3 00	08	42	2.333	9.731	158.107	+18	13	21.56	- 0	37.14	+19	28	32.51	-06	28.70
4 00	08	18	28.186	11.098	129.841	-23	22	13.24	+ 0	04.89	-22	20	26.45	-01	45.45

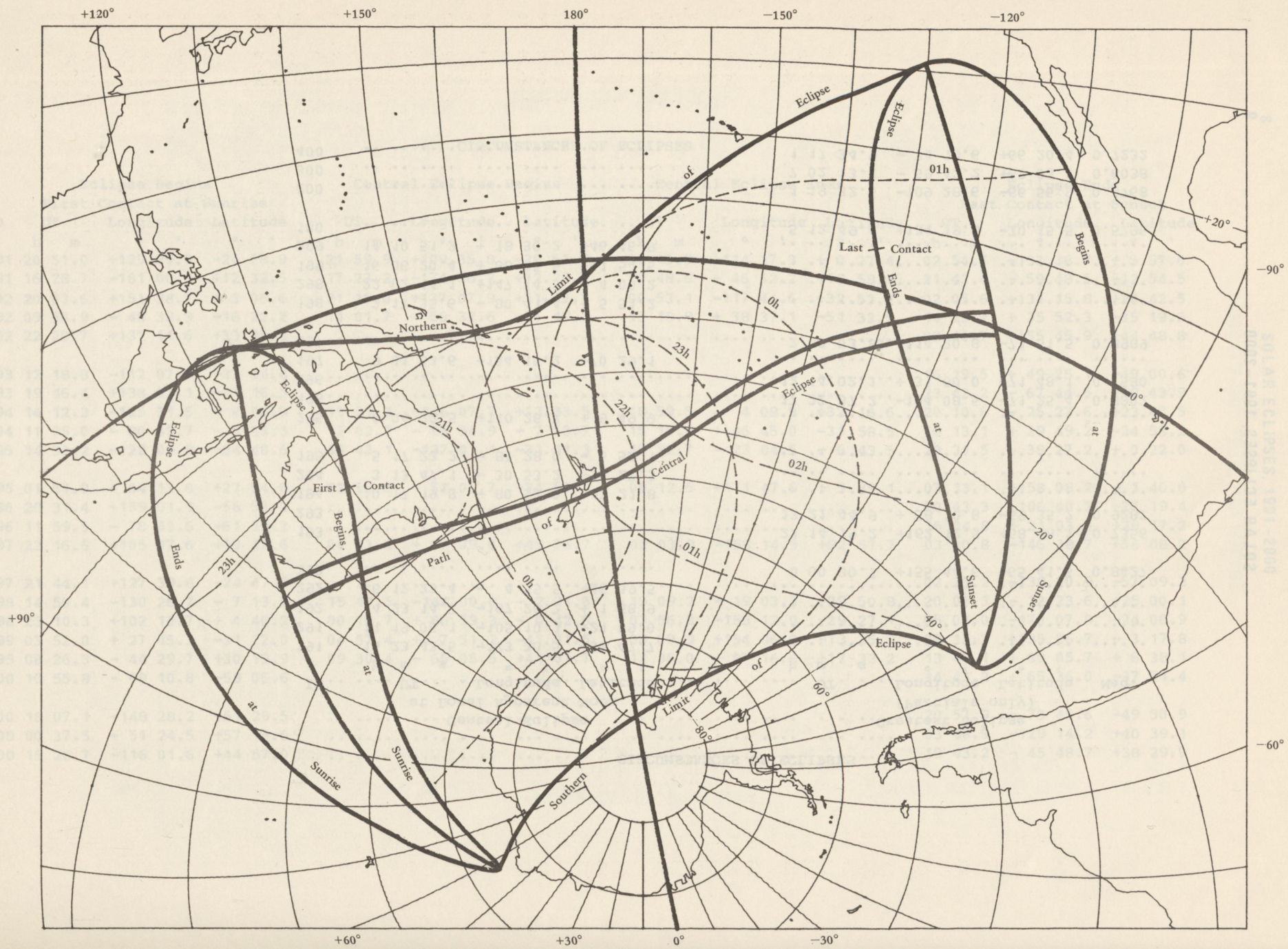
CIRCUMSTANCES OF ECLIPSES

ID	Eclipse Begins				Central Eclipse Begins				Central Eclipse Ends				Eclipse Ends			
	First Contact at Sunrise												Last Contact at Sunset			
	UT	Longitude	Latitude		UT	Longitude	Latitude		UT	Longitude	Latitude		UT	Longitude	Latitude	
	h m	° '	° '		h m	° '	° '		h m	° '	° '		h m	° '	° '	
191	20 51.0	+129 29.9	-24 28.9		21 59.9	+109 35.8	-29 51.9		01 45.9	-114 17.3	+ 0 27.4		02 54.7	-133 36.7	+ 5 57.0	
291	16 28.7	-161 00.1	+12 32.5		17 23.2	-174 36.2	+12 28.7		20 48.8	- 46 12.2	-12 58.4		21 43.4	- 59 48.5	-12 54.5	
192	20 03.6	+151 38.7	+ 3 08.6		21 16.0	+137 07.9	+11 32.7		00 53.1	-117 44.6	+32 53.2		02 05.6	-131 15.8	+24 42.5	
292	09 50.9	- 48 38.9	-18 22.2		11 01.7	- 56 32.6	-35 49.2		13 18.9	+ 38 37.1	-51 33.9		14 29.7	+ 35 52.3	-35 19.6	
392	22 20.7	+131 11.6	+33 15.3		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		02 40.7	-155 45.9	+44 48.8	
193	12 18.8	-112 07.8	+37 44.4		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		16 19.5	+ 49 25.1	+49 00.6	
293	19 46.4	+138 02.1	-31 16.5		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		23 43.2	- 67 44.5	-48 43.9	
194	14 12.2	-125 31.5	+ 4 56.9		15 23.3	-146 07.7	+13 33.5		18 59.5	- 4 08.8	+32 16.6		20 10.6	- 25 27.6	+23 47.5	
294	11 05.0	- 80 32.7	- 0 43.3		12 02.7	- 96 54.9	- 7 53.7		15 15.4	+ 46 45.0	-31 58.5		16 13.1	+ 29 49.2	-24 53.2	
195	14 33.2	-122 09.9	-24 40.5		15 42.1	-137 01.1	-31 41.3		19 22.7	- 23 04.5	- 6 43.5		20 31.5	- 38 27.2	+ 0 22.0	
295	01 51.9	+ 64 13.8	+27 34.8		02 52.6	+ 51 05.7	+34 50.2		06 12.5	+171 47.6	+ 5 39.1		07 13.1	+158 08.2	- 1 40.0	
196	20 31.4	+159 01.1	-56 53.3		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		00 43.3	-106 40.3	-27 19.4	
296	11 59.5	- 78 43.6	+61 59.2		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		16 04.8	+ 21 03.0	+29 17.2	
197	23 16.6	+105 07.6	+19 17.6		00 43.4	+ 87 09.0	+49 26.7		02 03.8	-158 14.9	+82 57.7		03 30.8	-146 18.7	+54 08.2	
297	21 44.1	+127 39.8	-24 47.5		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		02 23.2	-138 20.9	-57 09.2	
198	14 50.4	-130 28.7	- 7 13.5		15 47.5	-144 00.8	- 2 21.6		19 09.2	- 19 03.3	+29 50.8		20 06.3	- 32 23.6	+25 00.1	
298	23 10.3	+102 10.7	+ 4 46.2		00 15.7	+ 86 59.3	- 0 42.0		03 56.5	-155 12.0	-29 27.1		05 02.0	-170 07.8	-24 00.9	
199	03 52.0	+ 27 45.3	-31 22.0		04 57.4	+ 7 51.2	-41 31.5		08 09.9	+154 06.0	-13 35.9		09 15.2	+135 26.7	- 3 17.8	
299	08 26.3	- 44 29.7	+30 19.9		09 30.4	- 65 05.5	+41 01.7		12 36.0	+ 87 16.6	+17 33.2		13 40.1	+ 68 05.7	+ 6 38.1	
100	10 55.8	- 99 10.8	-59 05.6		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		14 43.2	+ 65 36.0	-37 54.4	
200	18 07.1	-148 28.2	-51 29.5		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		20 57.9	- 73 45.6	-49 50.9	
300	00 37.5	+ 51 24.5	+57 15.6		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		03 48.9	-129 14.2	+40 39.1	
400	15 26.7	-116 01.6	+44 57.0		.. ..	.. ..	.. ..		.. ..	.. ..	.. ..		19 43.2	- 45 48.7	+38 29.9	

CIRCUMSTANCES OF ECLIPSES

ID	Central Eclipse at Local Apparent Noon						Greatest Eclipse (Partials only)						Mag.		
	UT			Longitude		Latitude	UT			Longitude		Latitude			
	h	m	s	°	'	°	'	h	m	s	°	'		°	'
191	15	23	43.5	-173	30.5	-37	47.7	..	..	....	....	....	... ..	.....	
291	11	19	06.1	-105	10.1	+21	59.0	..	..	....	....	....	... ..	.....	
192	4	23	14.7	-167	26.7	+ 1	58.9	..	..	....	....	....	... ..	.....	
292	6	12	23.4	- 4	55.5	-26	39.5	..	..	....	....	....	... ..	.....	
392	..	..				...		0	00	30.7	+155	44.6	+65	41.6	0.8427
193	..	..				...		21	14	19.2	+162	12.5	+68	48.1	0.7356
293	..	..				...		13	21	44.9	+ 58	10.8	-69	35.2	0.9282
194	10	17	19.8	- 80	52.0	+42	21.8	..	..	....	....	....	... ..	.....	
294	3	13	47.1	- 30	53.2	-36	27.3	..	..	....	....	....	... ..	.....	
195	5	17	23.2	- 81	28.0	- 5	52.1	..	..	....	....	....	... ..	.....	
295	0	04	22.5	+110	26.7	+ 9	49.9	..	..	....	....	....	... ..	.....	
196	..	..				...		17	22	37.2	-104	08.5	-71	25.4	0.8802
296	..	..				...		12	14	02.1	+ 31	60.0	+71	48.1	0.7580
197	9	01	53.6	+154	15.2	+70	29.1	..	..	....	....	....	... ..	.....	
297	..	..				...		2	00	03.8	+114	20.8	-71	51.5	0.8989
198	2	17	35.6	- 80	41.4	+ 5	51.2	..	..	....	....	....	... ..	.....	
298	22	02	14.1	+147	14.3	- 4	00.2	..	..	....	....	....	... ..	.....	
199	16	06	20.4	+ 88	25.5	-41	54.5	..	..	....	....	....	... ..	.....	
299	11	10	51.2	+ 18	30.2	+46	46.9	..	..	....	....	....	... ..	.....	
100	..	..				...		5	12	49.4	+134	19.8	-70	15.5	0.5796
200	..	..				...		1	19	32.5	-109	28.6	-66	55.9	0.4768
300	..	..				...		7	02	13.1	- 59	42.2	+69	33.2	0.6038
400	..	..				...		1	17	34.9	- 74	10.6	+66	20.4	0.7232

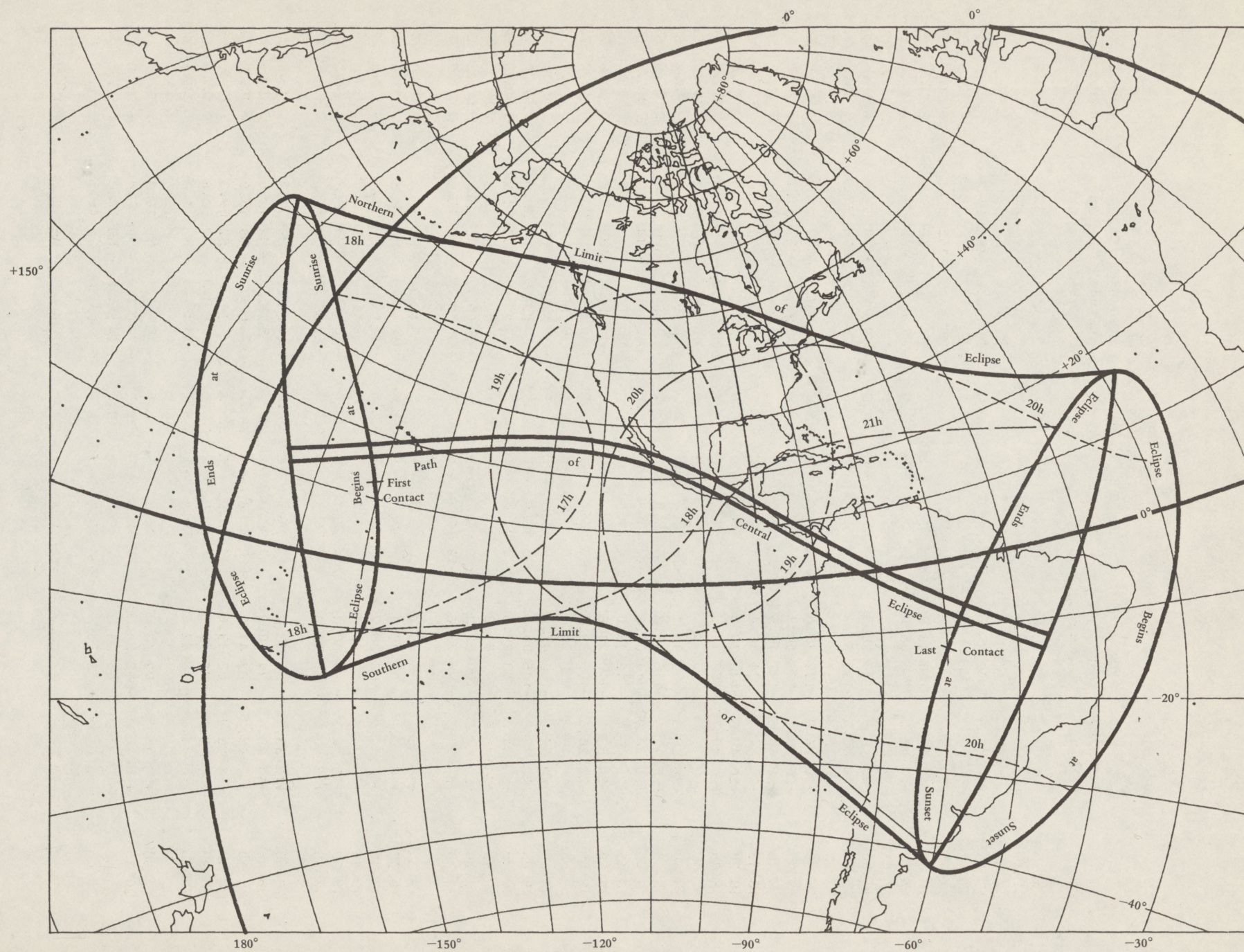
ANNULAR SOLAR ECLIPSE OF 1991 JANUARY 15-16



ANNULAR SOLAR ECLIPSE OF 1991 JANUARY 15-16
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line		
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.	
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	°	
LIMIT	-28 30.7	+110 37.5	-29 51.9	+109 35.8	-31 13.6	+108 31.7	5 34.8		
22 00	-31 54.3	+119 20.8	-30 50.0	+112 03.3	...	...	5 38.4	2	
22 05	-35 22.2	+129 17.2	-36 08.3	+126 42.0	-36 45.8	+123 37.0	6 03.5	17	
22 10	-37 13.9	+135 32.1	-38 14.2	+133 38.2	-39 11.7	+131 29.4	6 17.3	23	
22 15	-38 30.1	+140 31.5	-39 37.1	+139 00.5	-40 42.9	+137 19.2	6 28.7	29	
22 20	-39 25.0	+144 48.9	-40 36.1	+143 34.5	-41 46.6	+142 12.0	6 38.7	33	
22 25	-40 05.1	+148 38.6	-41 18.7	+147 37.5	-42 32.3	+146 29.8	6 47.8	37	
22 30	-40 33.8	+152 07.9	-41 49.0	+151 18.2	-43 04.5	+150 23.1	6 56.1	41	
22 35	-40 53.2	+155 21.4	-42 09.5	+154 41.8	-43 26.2	+153 57.7	7 03.7	44	
22 40	-41 04.8	+158 22.0	-42 21.6	+157 51.5	-43 39.1	+157 17.4	7 10.7	47	
22 45	-41 09.7	+161 11.5	-42 26.7	+160 49.4	-43 44.4	+160 24.4	7 17.0	50	
22 50	-41 08.7	+163 51.6	-42 25.6	+163 37.3	-43 43.3	+163 20.6	7 22.8	53	
22 55	-41 02.4	+166 23.4	-42 18.9	+166 16.2	-43 36.3	+166 07.2	7 28.1	56	
23 00	-40 51.3	+168 47.6	-42 07.3	+168 47.0	-43 24.1	+168 45.2	7 32.7	58	
23 05	-40 35.9	+171 05.0	-41 51.1	+171 10.7	-43 07.2	+171 15.4	7 36.8	60	
23 10	-40 16.5	+173 16.3	-41 30.8	+173 27.6	-42 46.0	+173 38.5	7 40.3	63	
23 15	-39 53.3	+175 21.9	-41 06.7	+175 38.5	-42 20.8	+175 55.0	7 43.2	65	
23 20	-39 26.8	+177 22.2	-40 39.0	+177 43.7	-41 52.0	+178 05.4	7 45.5	67	
23 25	-38 57.0	+179 17.7	-40 08.1	+179 43.8	-41 19.8	+179 49.7	7 47.3	69	
23 30	-38 24.2	+178 51.2	-39 34.0	+178 20.9	-40 44.4	+177 50.0	7 48.6	70	
23 35	-37 48.5	+177 04.2	-38 57.0	+176 30.0	-40 06.0	+175 55.1	7 49.2	72	
23 40	-37 10.0	+175 20.9	-38 17.1	+174 43.2	-39 24.8	+174 04.5	7 49.4	73	
23 45	-36 28.9	+173 41.0	-37 34.7	+173 00.0	-38 40.9	+172 17.9	7 49.1	73	
23 50	-35 45.3	+172 04.2	-36 49.7	+171 20.1	-37 54.5	+170 34.9	7 48.2	74	
23 55	-34 59.2	+170 30.2	-36 02.2	+169 43.3	-37 05.6	+168 55.1	7 46.9	74	
0 00	-34 10.7	+168 58.6	-35 12.3	+168 09.0	-36 14.3	+167 18.1	7 45.1	74	
0 05	-33 19.9	+167 29.1	-34 20.0	+166 37.1	-35 20.6	+165 43.7	7 42.9	73	
0 10	-32 26.7	+166 01.3	-33 25.5	+165 07.0	-34 24.6	+164 11.3	7 40.3	72	
0 15	-31 31.1	+164 35.0	-32 28.6	+163 38.6	-33 26.4	+162 40.6	7 37.3	71	
0 20	-30 33.2	+163 09.8	-31 29.4	+162 11.3	-32 25.9	+161 11.2	7 34.0	69	
0 25	-29 32.9	+161 45.2	-30 27.8	+160 44.8	-31 23.0	+159 42.6	7 30.3	67	
0 30	-28 30.2	+160 21.0	-29 23.8	+159 18.6	-30 17.7	+158 14.4	7 26.3	65	
0 35	-27 24.9	+158 56.5	-28 17.3	+157 52.2	-29 10.0	+156 46.1	7 21.9	63	
0 40	-26 17.0	+157 31.4	-27 08.2	+156 25.2	-27 59.6	+155 17.1	7 17.4	61	
0 45	-25 06.3	+156 05.0	-25 56.3	+154 56.8	-26 46.5	+153 46.8	7 12.5	59	
0 50	-23 52.6	+154 36.8	-24 41.4	+153 26.6	-25 30.5	+152 14.4	7 07.4	56	
0 55	-22 35.6	+153 05.8	-23 23.3	+151 53.5	-24 11.2	+150 39.0	7 02.0	53	
1 00	-21 15.1	+151 31.3	-22 01.6	+150 16.6	-22 48.3	+148 59.7	6 56.3	51	
1 05	-19 50.5	+149 52.0	-20 35.9	+148 34.7	-21 21.3	+147 14.9	6 50.4	48	
1 10	-18 21.4	+148 06.5	-19 05.5	+146 46.1	-19 49.6	+145 23.1	6 44.2	45	
1 15	-16 46.8	+146 12.8	-17 29.6	+144 48.8	-18 12.2	+143 21.9	6 37.7	41	
1 20	-15 05.8	+144 08.1	-15 46.9	+142 39.7	-16 27.9	+141 07.9	6 30.8	38	
1 25	-13 16.5	+141 48.3	-13 55.7	+140 14.2	-14 34.5	+138 35.9	6 23.5	34	
1 30	-11 16.4	+139 07.1	-11 53.0	+137 24.8	-12 28.7	+135 37.1	6 15.6	30	
1 35	- 9 00.5	+135 52.4	- 9 32.8	+133 57.4	-10 03.5	+131 54.3	6 06.8	24	
1 40	- 6 18.1	+131 38.2	- 6 41.8	+129 17.9	- 7 00.7	+126 40.8	5 56.3	18	
1 45	- 2 30.9	+124 49.3	- 2 13.5	+120 38.1	...	...	5 40.5	7	
LIMIT	+ 1 49.8	-115 08.3	+ 0 27.4	-114 17.3	- 0 55.7	-113 25.2	5 31.2		

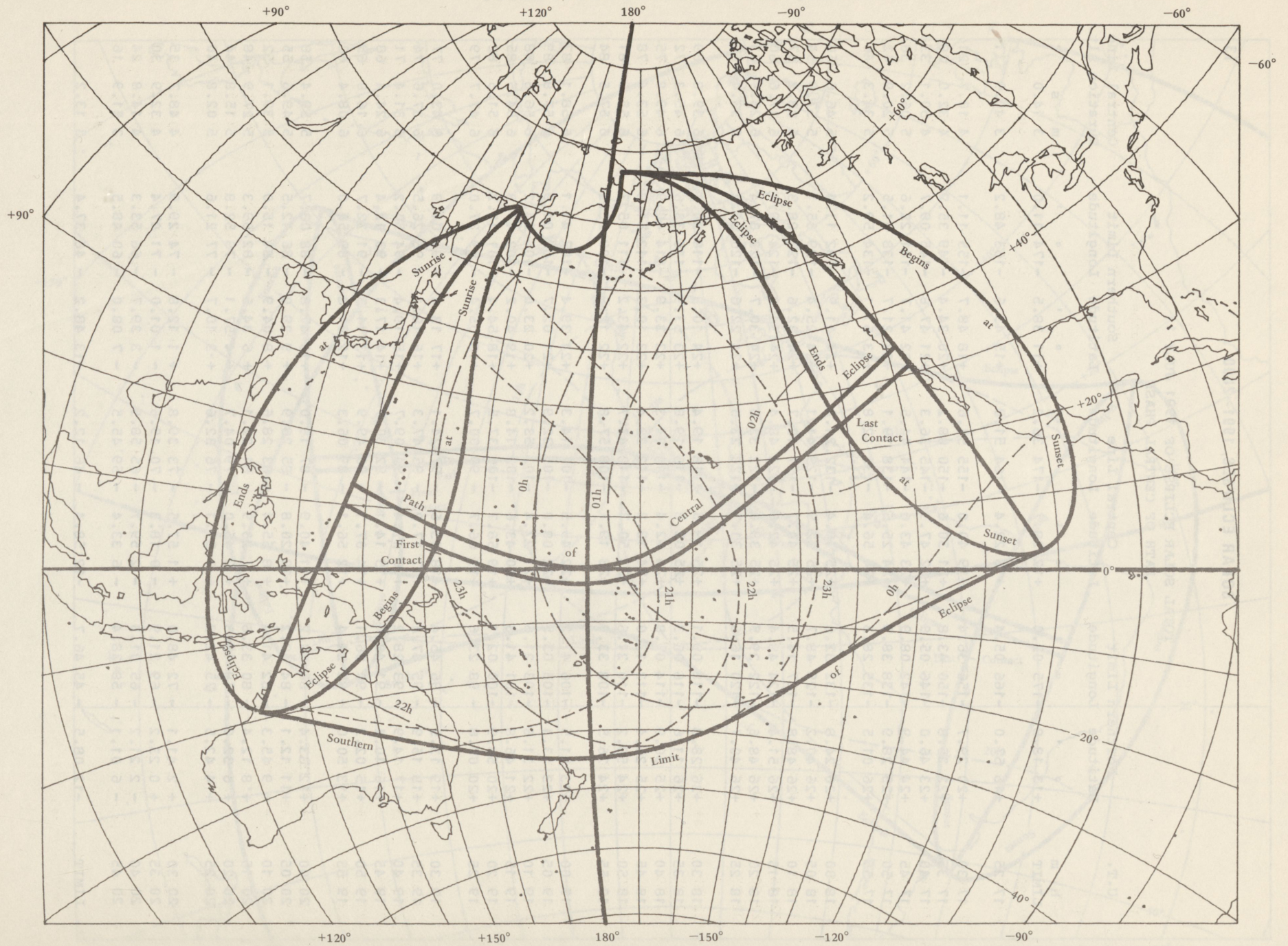
TOTAL SOLAR ECLIPSE OF 1991 JULY 11



TOTAL SOLAR ECLIPSE OF 1991 JULY 11
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	°
LIMIT	+13 18.8	-175 02.0	+12 28.7	-174 36.2	+11 38.5	-174 11.0	3 14.0	
17 25	+16 57.0	-166 05.4	+16 22.4	-164 51.8	+15 43.6	-163 48.2	3 40.9	11
17 30	+20 29.7	-156 36.4	+19 40.0	-155 51.6	+18 48.7	-155 11.1	4 10.7	21
17 35	+22 25.8	-150 43.8	+21 30.6	-150 08.2	+20 34.4	-149 35.9	4 32.0	28
17 40	+23 46.0	-146 05.8	+22 47.3	-145 36.3	+21 47.8	-145 09.7	4 50.1	33
17 45	+24 44.9	-142 08.9	+23 43.6	-141 44.5	+22 41.7	-141 22.6	5 06.2	38
17 50	+25 28.9	-138 38.9	+24 25.5	-138 19.1	+23 21.7	-138 01.5	5 20.9	42
17 55	+26 01.5	-135 28.3	+24 56.4	-135 12.8	+23 51.1	-134 59.2	5 34.3	46
18 00	+26 24.8	-132 32.6	+25 18.4	-132 21.1	+24 11.9	-132 11.4	5 46.6	50
18 05	+26 40.2	-129 48.7	+25 32.9	-129 41.1	+24 25.4	-129 35.1	5 57.9	54
18 10	+26 48.8	-127 14.5	+25 40.7	-127 10.7	+24 32.6	-127 08.3	6 08.2	57
18 15	+26 51.4	-124 48.4	+25 42.8	-124 48.4	+24 34.2	-124 49.4	6 17.6	60
18 20	+26 48.6	-122 29.5	+25 39.6	-122 33.0	+24 30.7	-122 37.4	6 25.9	63
18 25	+26 40.7	-120 16.6	+25 31.7	-120 23.5	+24 22.6	-120 31.2	6 33.4	66
18 30	+26 28.3	-118 09.1	+25 19.3	-118 19.4	+24 10.3	-118 30.1	6 39.8	69
18 35	+26 11.6	-116 06.3	+25 02.8	-116 19.8	+23 53.9	-116 33.6	6 45.3	72
18 40	+25 50.9	-114 07.8	+24 42.4	-114 24.3	+23 33.9	-114 40.9	6 49.8	75
18 45	+25 26.4	-112 13.0	+24 18.3	-112 32.4	+23 10.3	-112 51.8	6 53.4	78
18 50	+24 58.2	-110 21.6	+23 50.7	-110 43.7	+22 43.2	-111 05.7	6 55.9	81
18 55	+24 26.5	-108 33.1	+23 19.7	-108 57.8	+22 12.9	-109 22.3	6 57.5	84
19 00	+23 51.5	-106 47.2	+22 45.5	-107 14.3	+21 39.4	-107 41.1	6 58.1	87
19 05	+23 13.1	-105 03.5	+22 08.0	-105 32.9	+21 02.7	-106 01.9	6 57.8	89
19 10	+22 31.6	-103 21.6	+21 27.4	-103 53.2	+20 23.0	-104 24.2	6 56.6	88
19 15	+21 46.8	-101 41.3	+20 43.6	-102 14.8	+19 40.2	-102 47.8	6 54.5	85
19 20	+20 58.9	-100 02.1	+19 56.7	-100 37.5	+18 54.4	-101 12.2	6 51.5	82
19 25	+20 07.8	-98 23.6	+19 06.7	-99 00.7	+18 05.4	-99 37.0	6 47.7	79
19 30	+19 13.5	-96 45.4	+18 13.6	-97 24.1	+17 13.4	-98 01.9	6 43.0	77
19 35	+18 15.9	-95 07.1	+17 17.2	-95 47.3	+16 18.1	-96 26.5	6 37.6	74
19 40	+17 14.9	-93 28.2	+16 17.4	-94 09.7	+15 19.4	-94 50.2	6 31.4	71
19 45	+16 10.4	-91 48.1	+15 14.1	-92 30.7	+14 17.3	-93 12.4	6 24.4	68
19 50	+15 02.2	-90 06.1	+14 07.1	-90 49.9	+13 11.5	-91 32.7	6 16.8	65
19 55	+13 50.0	-88 21.4	+12 56.1	-89 06.3	+12 01.8	-89 50.0	6 08.4	62
20 00	+12 33.4	-86 33.2	+11 40.9	-87 19.0	+10 47.8	-88 03.7	5 59.4	58
20 05	+11 12.1	-84 40.2	+10 20.8	-85 26.9	+9 29.0	-86 12.5	5 49.6	55
20 10	+9 45.3	-82 41.0	+8 55.4	-83 28.6	+8 04.9	-84 15.0	5 39.1	52
20 15	+8 12.4	-80 33.6	+7 23.9	-81 22.1	+6 34.6	-82 09.3	5 27.9	48
20 20	+6 32.0	-78 15.3	+5 45.0	-79 04.7	+4 57.1	-79 52.8	5 15.8	44
20 25	+4 42.5	-75 42.2	+3 57.1	-76 32.6	+3 10.7	-77 21.6	5 02.8	40
20 30	+2 41.1	-72 48.0	+1 57.5	-73 39.8	+1 12.8	-74 29.9	4 48.7	35
20 35	+0 23.2	-69 21.9	-0 18.3	-70 15.6	-1 01.0	-71 07.4	4 32.9	30
20 40	-2 21.2	-65 01.3	-2 59.7	-65 58.5	-3 39.7	-66 53.3	4 14.8	24
20 45	-6 01.1	-58 38.4	-6 33.4	-59 45.5	-7 08.0	-60 48.5	3 51.9	16
LIMIT	-12 08.5	-45 46.7	-12 58.4	-46 12.2	-13 48.2	-46 37.4	3 13.2	

ANNULAR SOLAR ECLIPSE OF 1992 JANUARY 4-5



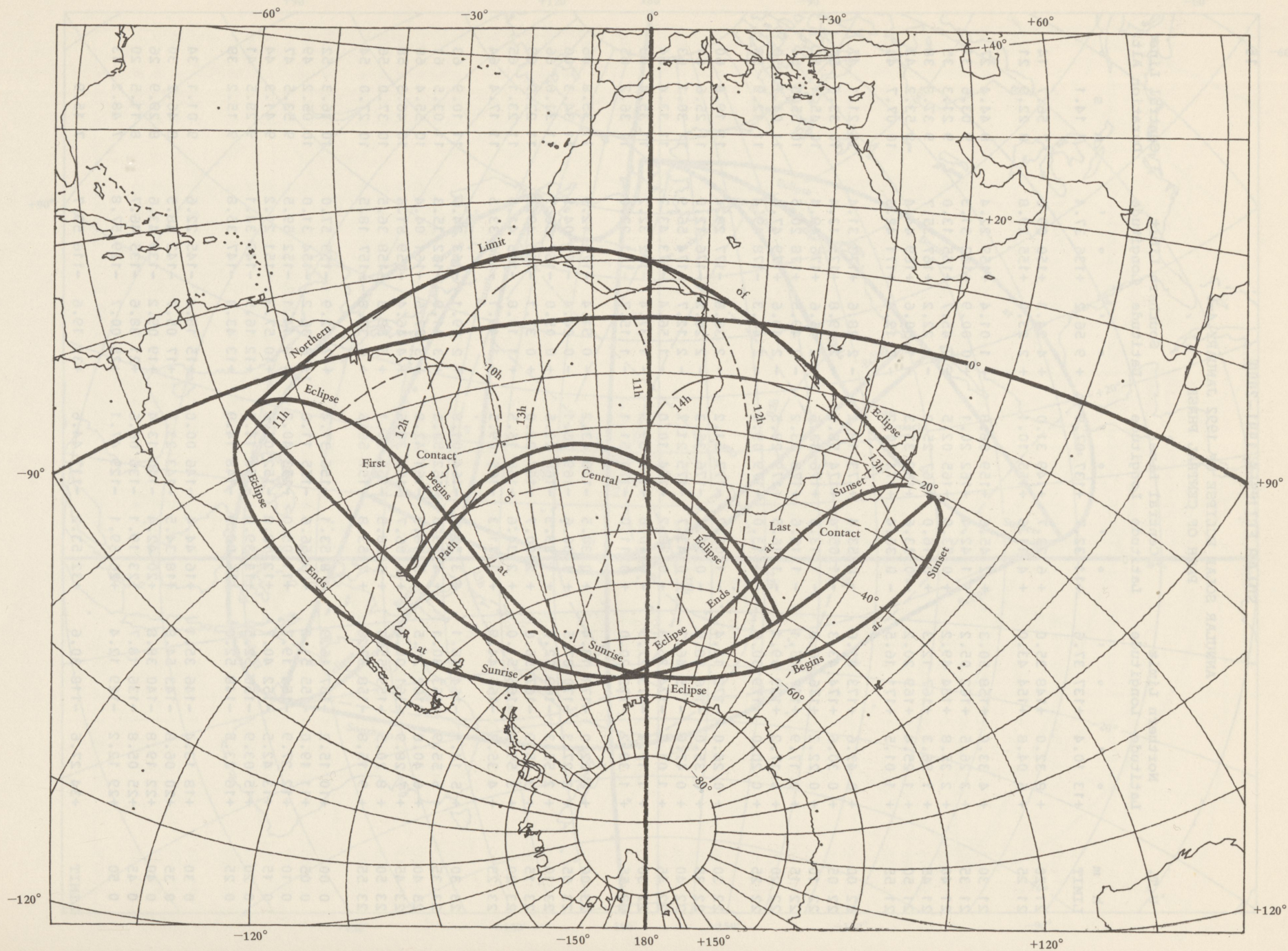
SOLAR ECLIPSES, 1991-2000

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ANNULAR SOLAR ECLIPSE OF 1992 JANUARY 4-5
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line		
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.	
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	°	
LIMIT	+13 10.4	+137 37.6	+11 32.7	+137 07.9	+ 9 56.2	+136 37.4	7 14.1		
21 20	+ 8 32.0	+148 35.0	+ 6 23.7	+149 31.0	+ 4 24.3	+150 09.6	7 56.7	14	
21 25	+ 6 04.8	+154 43.0	+ 4 11.6	+155 10.1	+ 2 23.0	+155 29.8	8 22.9	21	
21 30	+ 4 33.0	+158 50.3	+ 2 45.6	+159 08.8	+ 1 01.4	+159 22.4	8 44.4	27	
21 35	+ 3 26.5	+162 05.2	+ 1 42.4	+162 20.1	+ 0 00.9	+162 31.3	9 03.6	31	
21 40	+ 2 35.8	+164 49.2	+ 0 53.9	+165 02.5	- 0 45.7	+165 13.0	9 21.3	35	
21 45	+ 1 56.3	+167 12.3	+ 0 16.0	+167 25.2	- 1 22.2	+167 35.7	9 37.8	38	
21 50	+ 1 25.4	+169 20.2	- 0 13.6	+169 33.3	- 1 50.6	+169 44.4	9 53.2	42	
21 55	+ 1 01.5	+171 16.5	- 0 36.4	+171 30.2	- 2 12.4	+171 42.3	10 07.7	44	
22 00	+ 0 43.6	+173 03.6	- 0 53.4	+173 18.2	- 2 28.6	+173 31.4	10 21.1	47	
22 05	+ 0 30.6	+174 43.3	- 1 05.4	+174 58.9	- 2 39.8	+175 13.4	10 33.6	50	
22 10	+ 0 22.2	+176 16.8	- 1 13.0	+176 33.6	- 2 46.6	+176 49.4	10 45.1	52	
22 15	+ 0 17.9	+177 45.1	- 1 16.6	+178 03.2	- 2 49.5	+178 20.5	10 55.5	54	
22 20	+ 0 17.2	+179 09.1	- 1 16.5	+179 28.5	- 2 48.6	+179 47.4	11 04.7	56	
22 25	+ 0 20.0	-179 30.6	- 1 13.0	-179 09.8	- 2 44.3	-178 49.4	11 12.9	58	
22 30	+ 0 26.0	-178 13.4	- 1 06.2	-177 51.2	- 2 36.8	-177 29.4	11 19.8	60	
22 35	+ 0 35.0	-176 58.9	- 0 56.4	-176 35.3	- 2 26.2	-176 12.0	11 25.6	61	
22 40	+ 0 47.0	-175 46.7	- 0 43.7	-175 21.7	- 2 12.7	-174 56.9	11 30.1	63	
22 45	+ 1 01.7	-174 36.3	- 0 28.2	-174 10.0	- 1 56.4	-173 43.7	11 33.4	64	
22 50	+ 1 19.1	-173 27.5	- 0 10.0	-172 59.9	- 1 37.4	-172 32.2	11 35.4	65	
22 55	+ 1 39.2	-172 20.0	+ 0 11.0	-171 51.1	- 1 15.7	-171 22.0	11 36.2	65	
23 00	+ 2 02.0	-171 13.4	+ 0 34.5	-170 43.2	- 0 51.4	-170 12.9	11 35.8	66	
23 05	+ 2 27.3	-170 07.5	+ 1 00.6	-169 36.1	- 0 24.4	-169 04.5	11 34.3	66	
23 10	+ 2 55.3	-169 02.0	+ 1 29.3	-168 29.5	+ 0 05.0	-167 56.7	11 31.6	66	
23 15	+ 3 25.9	-167 56.6	+ 2 00.7	-167 23.0	+ 0 37.1	-166 49.1	11 27.9	65	
23 20	+ 3 59.2	-166 51.0	+ 2 34.6	-166 16.5	+ 1 11.8	-165 41.5	11 23.1	65	
23 25	+ 4 35.3	-165 44.9	+ 3 11.3	-165 09.5	+ 1 49.1	-164 33.5	11 17.4	64	
23 30	+ 5 14.1	-164 38.1	+ 3 50.8	-164 01.8	+ 2 29.1	-163 24.9	11 10.9	63	
23 35	+ 5 55.9	-163 30.1	+ 4 33.0	-162 53.0	+ 3 11.9	-162 15.3	11 03.5	61	
23 40	+ 6 40.8	-162 20.5	+ 5 18.3	-161 42.8	+ 3 57.6	-161 04.4	10 55.4	60	
23 45	+ 7 28.9	-161 09.0	+ 6 06.7	-160 30.6	+ 4 46.4	-159 51.6	10 46.5	58	
23 50	+ 8 20.5	-159 55.0	+ 6 58.5	-159 16.1	+ 5 38.3	-158 36.5	10 37.0	56	
23 55	+ 9 15.8	-158 37.8	+ 7 53.8	-157 58.6	+ 6 33.8	-157 18.5	10 27.0	54	
0 00	+10 15.2	-157 16.9	+ 8 53.1	-156 37.4	+ 7 32.9	-155 57.0	10 16.3	52	
0 05	+11 19.0	-155 51.2	+ 9 56.6	-155 11.6	+ 8 36.2	-154 31.0	10 05.2	49	
0 10	+12 27.9	-154 19.7	+11 05.0	-153 40.2	+ 9 44.1	-152 59.5	9 53.5	47	
0 15	+13 42.5	-152 40.7	+12 18.8	-152 01.6	+10 57.3	-151 21.2	9 41.3	44	
0 20	+15 03.9	-150 52.5	+13 39.0	-150 14.1	+12 16.5	-149 34.1	9 28.5	41	
0 25	+16 33.5	-148 52.0	+15 06.9	-148 14.9	+13 43.0	-147 35.8	9 15.2	38	
0 30	+18 13.4	-146 35.1	+16 44.4	-146 00.0	+15 18.4	-145 22.6	9 01.1	34	
0 35	+20 06.8	-143 54.8	+18 34.5	-143 23.3	+17 05.7	-142 48.5	8 46.2	30	
0 40	+22 19.8	-140 38.8	+20 42.4	-140 13.4	+19 09.2	-139 43.6	8 29.9	26	
0 45	+25 05.8	-136 18.7	+23 19.1	-136 06.6	+21 38.6	-135 46.7	8 11.5	20	
0 50	+29 12.2	-129 12.4	+26 59.1	-129 47.1	+25 00.7	-129 57.8	7 48.2	13	
LIMIT	+34 27.6	-118 30.6	+32 53.2	-117 44.6	+31 19.6	-116 59.7	7 15.9		

TOTAL SOLAR ECLIPSE OF 1992 JUNE 30



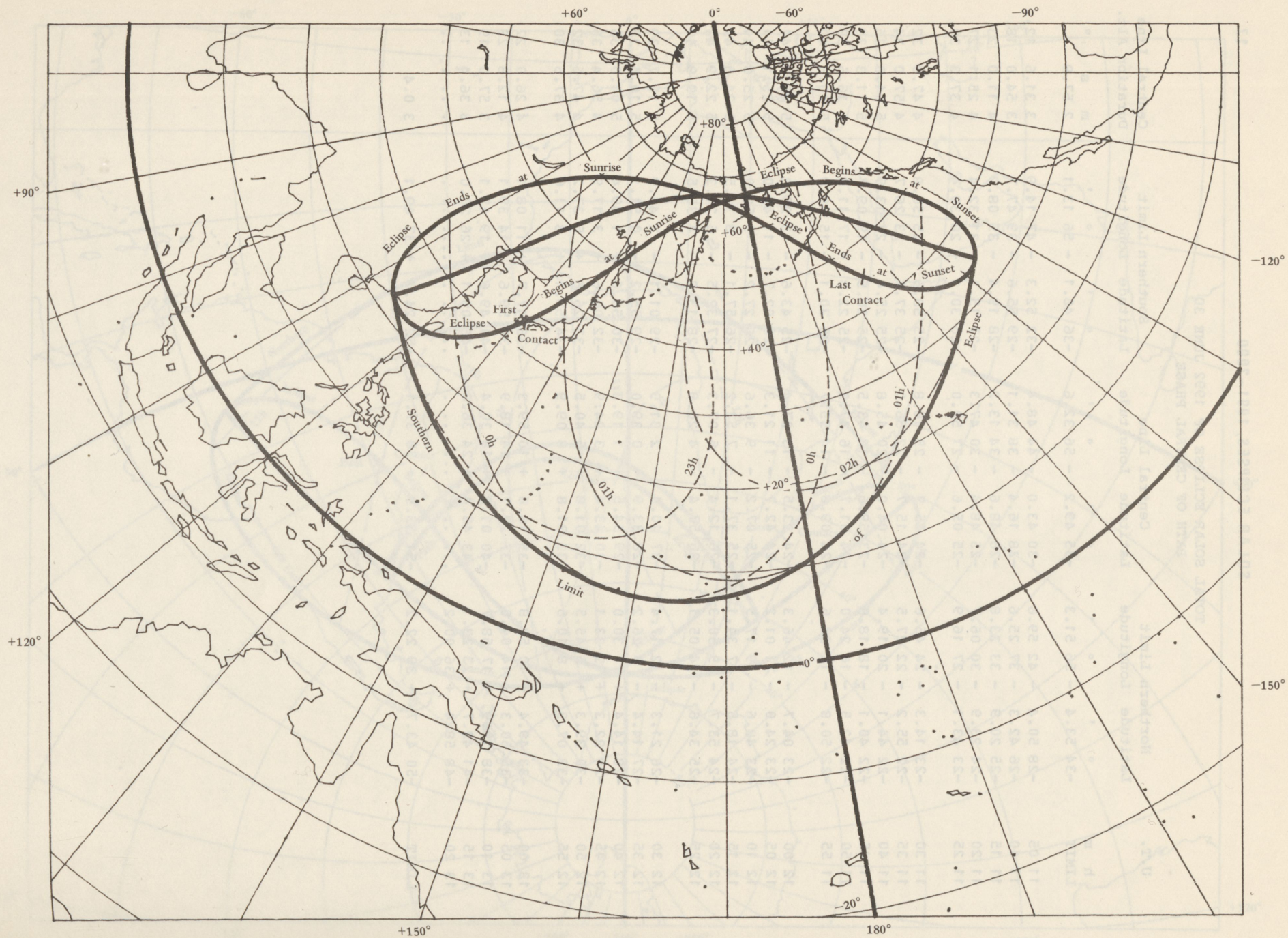
SOLAR ECLIPSES, 1991-2000

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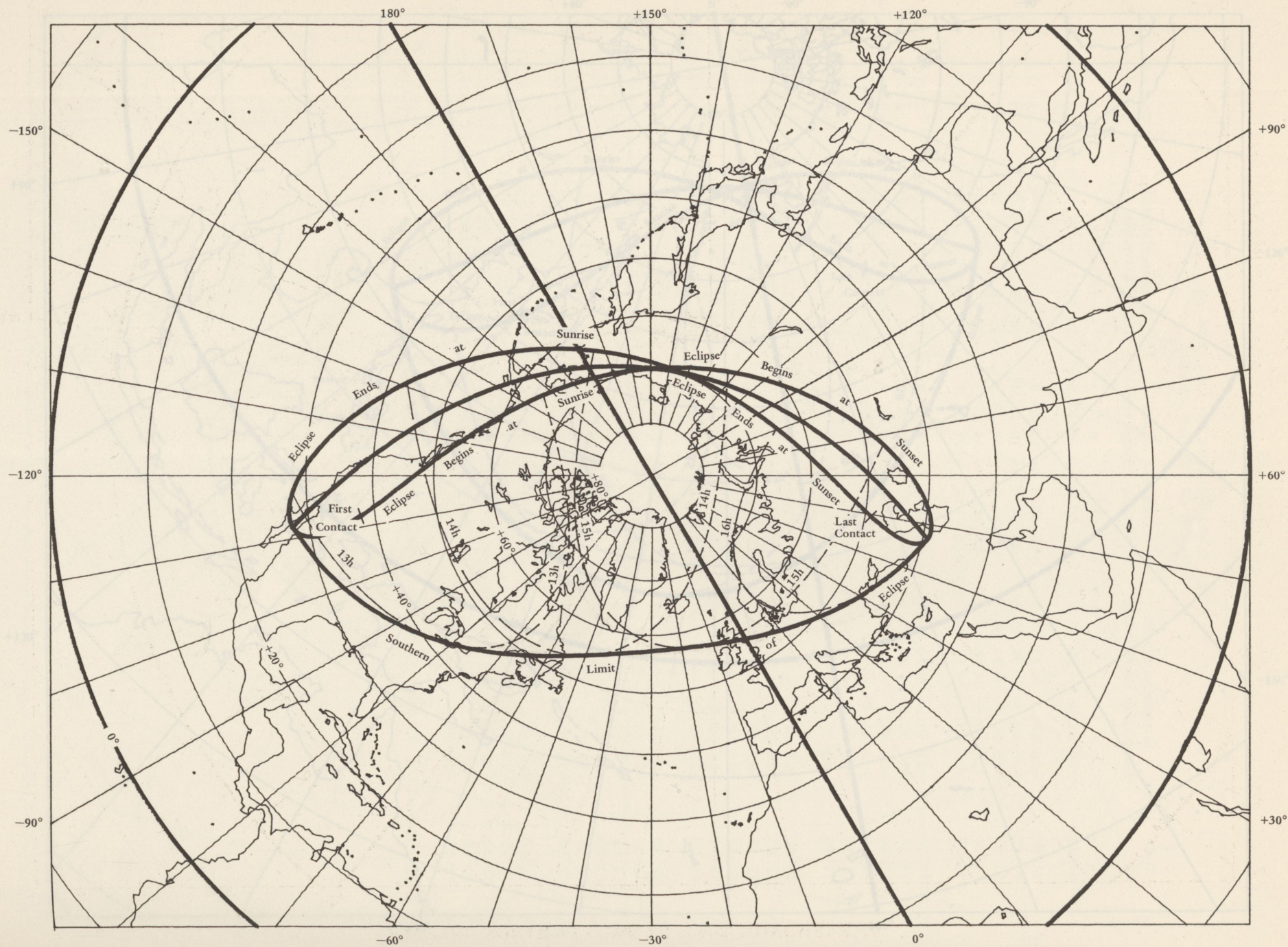
TOTAL SOLAR ECLIPSE OF 1992 JUNE 30
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	°
LIMIT	-34 53.4	- 56 51.3	-35 49.2	- 56 32.6	-36 46.1	- 56 13.1	2 57.8	
11 05	-28 50.4	- 42 59.6	-30 43.0	- 44 48.4	-32 52.3	- 47 14.9	3 31.6	12
11 10	-26 42.3	- 37 25.6	-28 16.4	- 38 31.1	-29 55.6	- 39 47.7	3 54.0	18
11 15	-25 20.9	- 33 23.8	-26 48.6	- 34 13.2	-28 19.4	- 35 08.9	4 11.0	23
11 20	-24 23.9	- 30 06.7	-25 48.4	- 30 47.3	-27 15.1	- 31 32.4	4 25.1	27
11 25	-23 43.1	- 27 16.9	-25 05.6	- 27 52.0	-26 30.1	- 28 30.4	4 37.3	30
11 30	-23 14.3	- 24 45.6	-24 35.7	- 25 16.8	-25 58.6	- 25 50.8	4 47.9	32
11 35	-22 55.2	- 22 27.5	-24 15.7	- 22 56.0	-25 37.7	- 23 26.7	4 57.0	34
11 40	-22 44.1	- 20 19.4	-24 04.0	- 20 45.8	-25 25.4	- 21 13.9	5 04.8	36
11 45	-22 40.1	- 18 18.8	-23 59.6	- 18 43.5	-25 20.5	- 19 09.7	5 11.3	38
11 50	-22 42.5	- 16 24.0	-24 01.7	- 16 47.3	-25 22.3	- 17 11.8	5 16.6	39
11 55	-22 50.8	- 14 33.6	-24 09.8	- 14 55.7	-25 30.1	- 15 18.8	5 20.6	40
12 00	-23 04.7	- 12 46.3	-24 23.5	- 13 07.4	-25 43.6	- 13 29.2	5 23.5	41
12 05	-23 24.0	- 11 01.2	-24 42.7	- 11 21.3	-26 02.7	- 11 42.0	5 25.1	41
12 10	-23 48.6	- 9 17.5	-25 07.2	- 9 36.6	-26 27.2	- 9 56.0	5 25.6	41
12 15	-24 18.5	- 7 34.1	-25 37.1	- 7 52.2	-26 57.1	- 8 10.5	5 24.8	41
12 20	-24 53.7	- 5 50.3	-26 12.4	- 6 07.3	-27 32.5	- 6 24.3	5 22.9	41
12 25	-25 34.6	- 4 05.1	-26 53.4	- 4 20.9	-28 13.8	- 4 36.5	5 19.9	40
12 30	-26 21.3	- 2 17.4	-27 40.4	- 2 31.9	-29 01.1	- 2 45.9	5 15.7	39
12 35	-27 14.4	- 0 26.2	-28 33.9	- 0 39.0	-29 55.2	- 0 51.1	5 10.4	38
12 40	-28 14.4	+ 1 30.0	-29 34.5	+ 1 19.3	-30 56.6	+ 1 09.4	5 04.0	36
12 45	-29 22.3	+ 3 33.1	-30 43.4	+ 3 24.9	-32 06.6	+ 3 17.9	4 56.4	35
12 50	-30 39.3	+ 5 45.5	-32 01.8	+ 5 40.5	-33 26.6	+ 5 37.2	4 47.6	32
12 55	-32 07.3	+ 8 10.6	-33 31.8	+ 8 09.9	-34 59.1	+ 8 11.6	4 37.5	30
13 00	-33 49.4	+ 10 53.8	-35 16.8	+ 10 59.3	-36 47.7	+ 11 08.1	4 26.0	27
13 05	-35 50.3	+ 14 04.0	-37 22.7	+ 14 18.9	-38 59.6	+ 14 39.1	4 12.8	23
13 10	-38 19.9	+ 17 58.7	-40 01.2	+ 18 30.4	-41 49.6	+ 19 12.1	3 57.0	19
13 15	-41 42.7	+ 23 23.1	-43 46.4	+ 24 36.8	-46 09.1	+ 26 23.0	3 36.4	13
13 20	-48 58.4	+ 36 00.2	... ..	... ..	... ..	... ..	... ..	..
LIMIT	-50 43.7	+ 39 22.2	-51 33.9	+ 38 37.1	-52 24.7	+ 37 49.1	3 0.4	

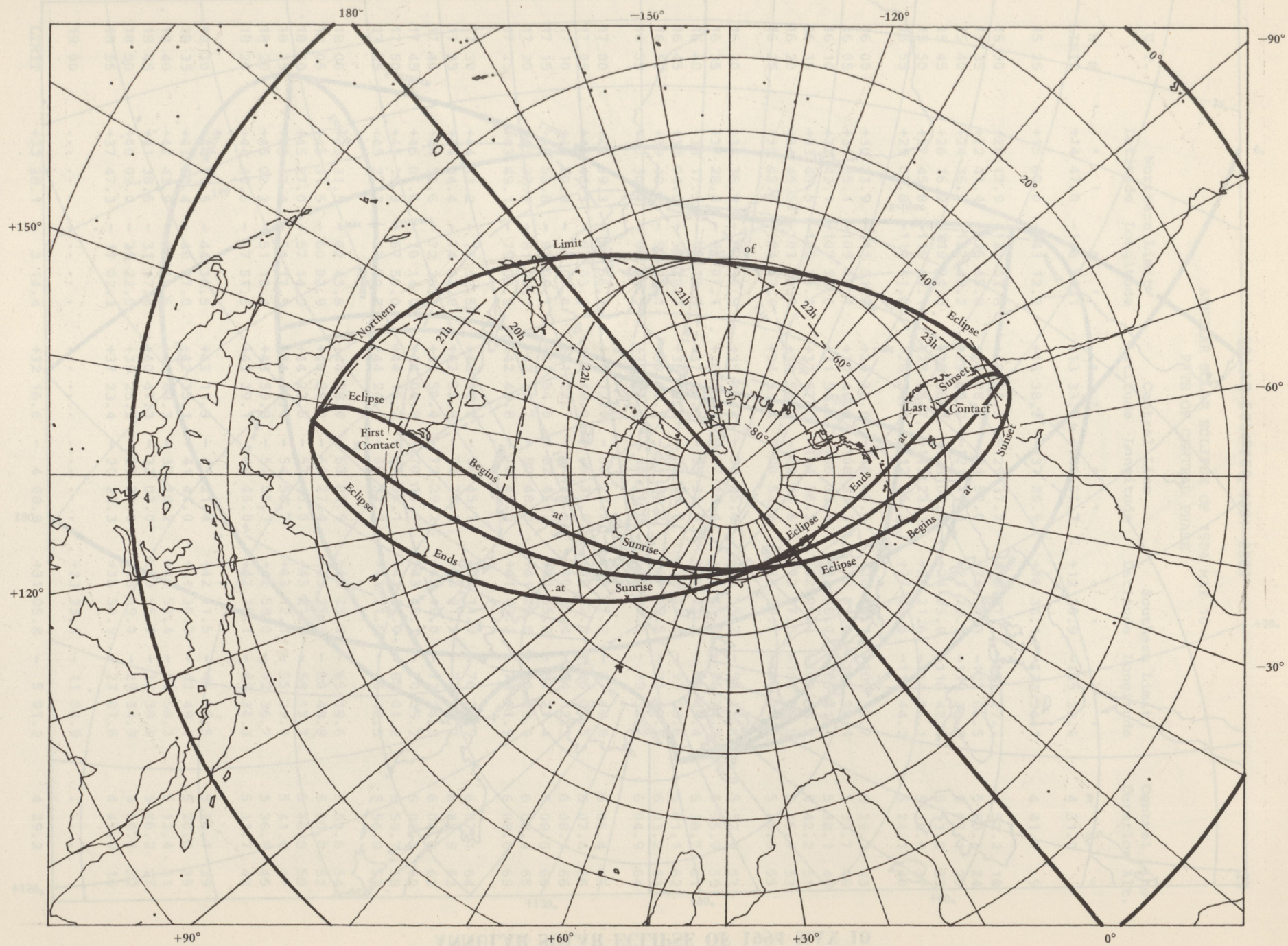
PARTIAL SOLAR ECLIPSE OF 1992 DECEMBER 23-24



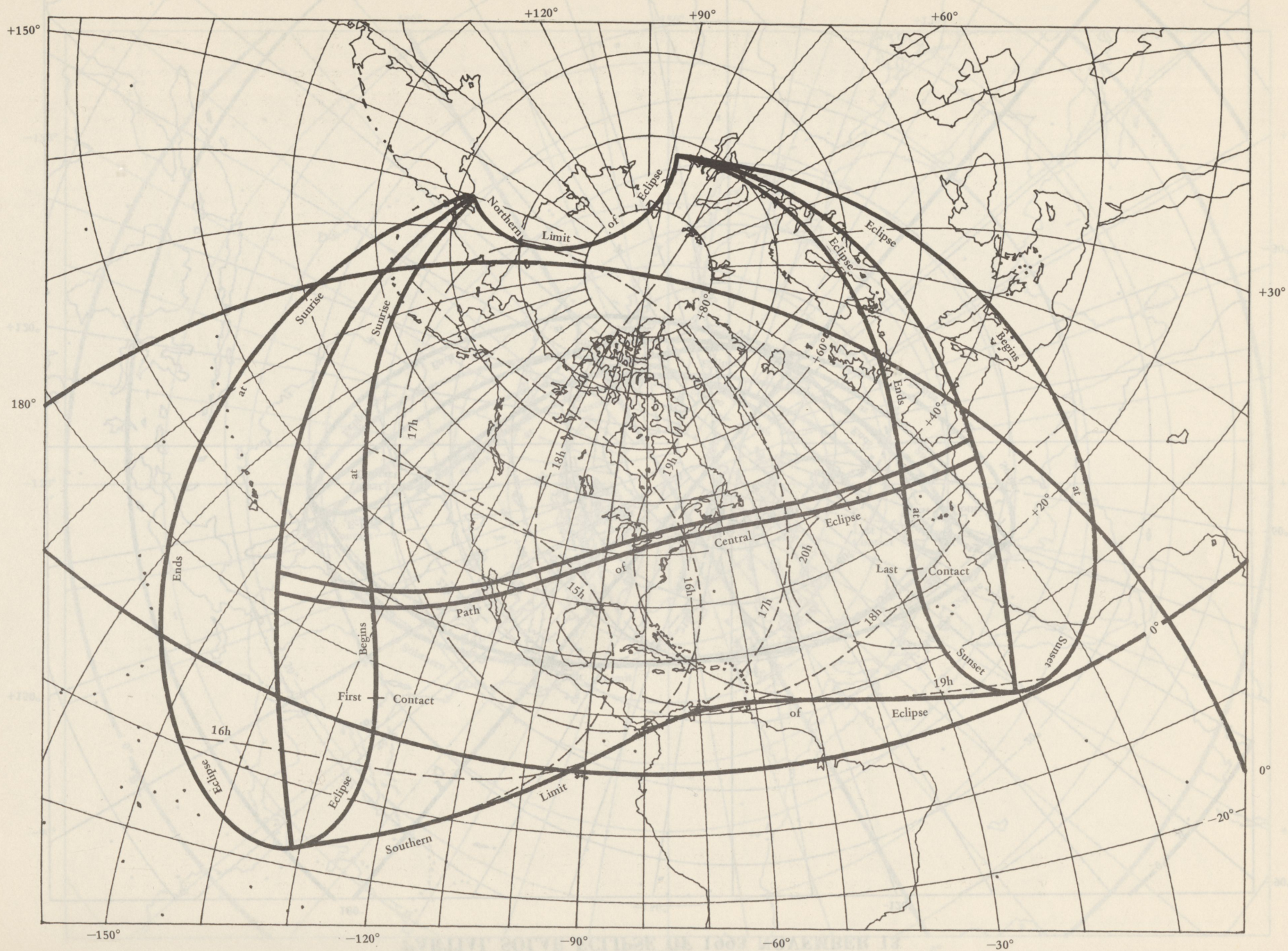
PARTIAL SOLAR ECLIPSE OF 1993 MAY 21



PARTIAL SOLAR ECLIPSE OF 1993 NOVEMBER 13



—90° —60°



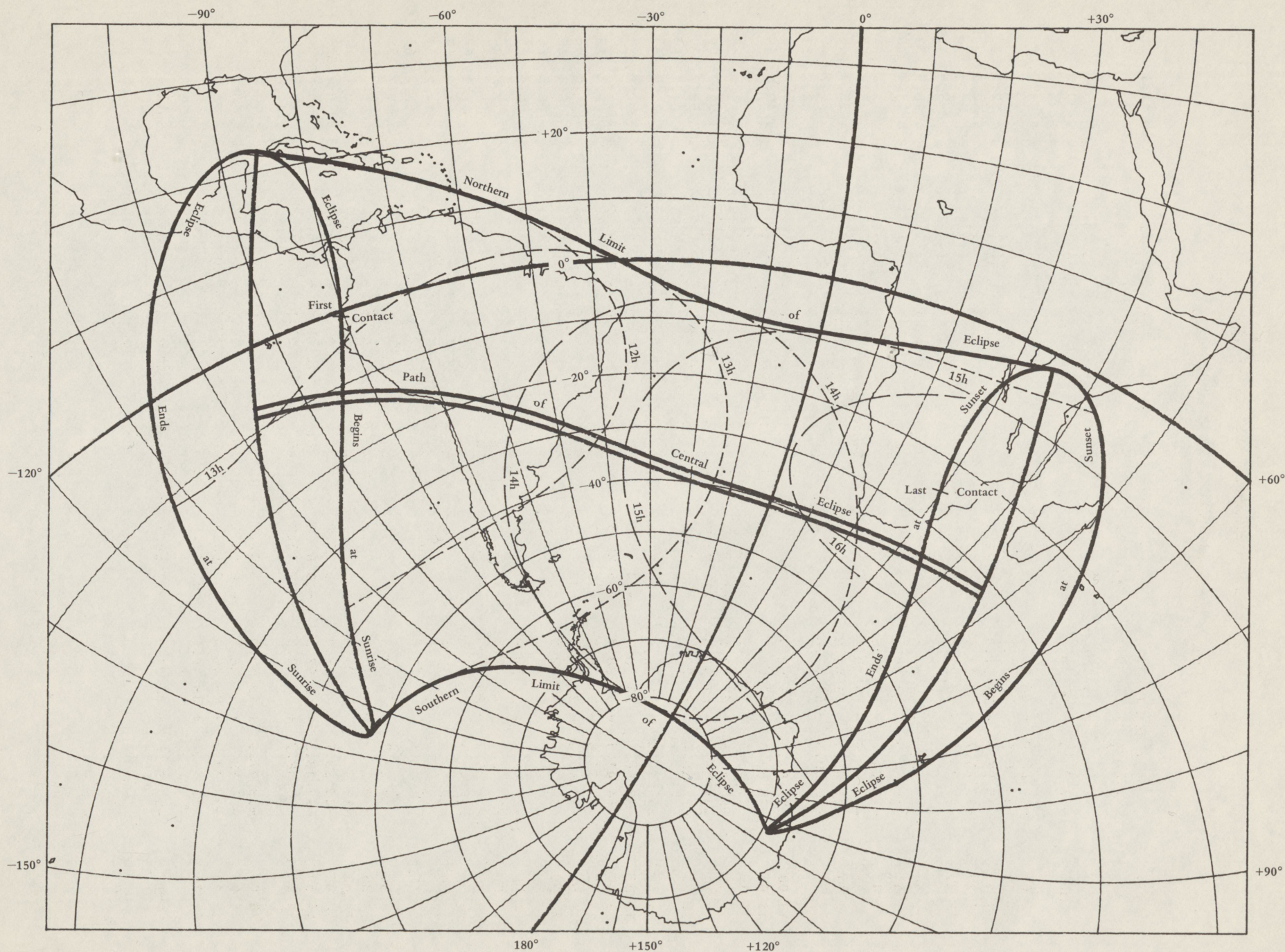
SOLAR ECLIPSES, 1991-2000

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ANNULAR SOLAR ECLIPSE OF 1994 MAY 10
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line		
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.	
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	°	
LIMIT	+14 47.0	-146 54.1	+13 33.5	-146 07.7	+12 20.9	-145 22.6	4 31.0		
15 25	+15 60.0	-143 12.2	+16 38.2	-137 25.9	+16 36.1	-133 54.1	4 41.0	9	
15 30	+20 17.9	-132 03.8	+19 54.3	-129 37.7	+19 27.2	-127 27.7	4 52.2	18	
15 35	+22 41.4	-126 45.8	+22 08.5	-124 52.0	+21 34.3	-123 06.5	5 00.3	24	
15 40	+24 36.5	-122 49.2	+23 59.2	-121 11.3	+23 21.3	-119 38.9	5 07.1	29	
15 45	+26 16.2	-119 34.0	+25 36.1	-118 06.0	+24 55.8	-116 42.4	5 13.2	33	
15 50	+27 45.8	-116 44.1	+27 03.7	-115 23.3	+26 21.6	-114 06.1	5 18.9	37	
15 55	+29 07.8	-114 11.6	+28 24.1	-112 56.3	+27 40.6	-111 44.2	5 24.1	40	
16 00	+30 23.9	-111 51.3	+29 38.9	-110 40.6	+28 54.1	-109 32.7	5 29.1	43	
16 05	+31 35.1	-109 40.1	+30 48.9	-108 33.3	+30 03.0	-107 29.1	5 33.7	46	
16 10	+32 42.1	-107 35.6	+31 54.9	-106 32.4	+31 08.0	-105 31.4	5 38.1	49	
16 15	+33 45.5	-105 36.3	+32 57.2	-104 36.2	+32 09.4	-103 38.2	5 42.2	51	
16 20	+34 45.5	-103 40.7	+33 56.3	-102 43.6	+33 07.5	-101 48.5	5 46.1	53	
16 25	+35 42.6	-101 47.9	+34 52.4	-100 53.6	+34 02.7	-100 01.2	5 49.6	55	
16 30	+36 36.8	- 99 56.9	+35 45.8	- 99 05.4	+34 55.2	- 98 15.6	5 52.9	57	
16 35	+37 28.4	- 98 07.1	+36 36.4	- 97 18.4	+35 45.0	- 96 31.2	5 55.9	59	
16 40	+38 17.5	- 96 17.9	+37 24.6	- 95 31.9	+36 32.2	- 94 47.4	5 58.7	61	
16 45	+39 04.0	- 94 28.7	+38 10.3	- 93 45.5	+37 17.1	- 93 03.6	6 01.1	62	
16 50	+39 48.2	- 92 39.1	+38 53.5	- 91 58.7	+37 59.5	- 91 19.5	6 03.2	63	
16 55	+40 30.0	- 90 48.5	+39 34.4	- 90 11.0	+38 39.5	- 89 34.7	6 04.9	64	
17 00	+41 09.3	- 88 56.7	+40 12.9	- 88 22.2	+39 17.2	- 87 48.8	6 06.4	65	
17 05	+41 46.3	- 87 03.2	+40 49.0	- 86 31.9	+39 52.5	- 86 01.5	6 07.4	66	
17 10	+42 20.8	- 85 07.6	+41 22.7	- 84 39.6	+40 25.4	- 84 12.5	6 08.1	66	
17 15	+42 52.8	- 83 09.7	+41 54.0	- 82 45.2	+40 55.8	- 82 21.4	6 08.5	66	
17 20	+43 22.3	- 81 09.1	+42 22.7	- 80 48.3	+41 23.8	- 80 28.0	6 08.4	65	
17 25	+43 49.1	- 79 05.5	+42 48.8	- 78 48.5	+41 49.2	- 78 31.9	6 08.0	65	
17 30	+44 13.2	- 76 58.5	+43 12.2	- 76 45.7	+42 11.9	- 76 32.9	6 07.1	64	
17 35	+44 34.4	- 74 47.8	+43 32.8	- 74 39.3	+42 31.9	- 74 30.7	6 05.9	63	
17 40	+44 52.6	- 72 33.1	+43 50.4	- 72 29.2	+42 49.0	- 72 24.9	6 04.2	62	
17 45	+45 07.6	- 70 14.0	+44 04.9	- 70 14.9	+43 03.1	- 70 15.2	6 02.2	60	
17 50	+45 19.3	- 67 50.0	+44 16.2	- 67 56.1	+43 14.0	- 68 01.2	5 59.7	58	
17 55	+45 27.3	- 65 20.7	+44 24.0	- 65 32.3	+43 21.5	- 65 42.5	5 56.9	57	
18 00	+45 31.5	- 62 45.6	+44 28.0	- 63 02.9	+43 25.3	- 63 18.6	5 53.6	54	
18 05	+45 31.5	- 60 03.9	+44 28.0	- 60 27.4	+43 25.3	- 60 48.9	5 50.0	52	
18 10	+45 27.0	- 57 14.9	+44 23.6	- 57 45.0	+43 21.0	- 58 12.7	5 46.0	50	
18 15	+45 17.4	- 54 17.5	+44 14.4	- 54 54.7	+43 12.1	- 55 29.0	5 41.6	47	
18 20	+45 02.2	- 51 10.4	+43 59.8	- 51 55.3	+42 58.0	- 52 36.7	5 36.8	45	
18 25	+44 40.6	- 47 51.6	+43 39.1	- 48 45.0	+42 38.1	- 49 34.3	5 31.7	42	
18 30	+44 11.5	- 44 18.5	+43 11.3	- 45 21.4	+42 11.5	- 46 19.5	5 26.1	39	
18 35	+43 33.4	- 40 27.0	+42 35.1	- 41 41.0	+41 36.9	- 42 49.1	5 20.0	35	
18 40	+42 43.9	- 36 10.6	+41 48.3	- 37 38.2	+40 52.4	- 38 58.3	5 13.4	31	
18 45	+41 38.6	- 31 17.4	+40 47.3	- 33 03.0	+39 55.0	- 34 38.9	5 06.2	27	
18 50	+40 09.0	- 25 22.0	+39 25.2	- 27 35.8	+38 39.0	- 29 34.9	4 58.0	22	
18 55	+37 47.3	- 17 02.3	+37 23.4	- 20 22.3	+36 50.9	- 23 07.6	4 47.9	15	
19 00	... ..	... ..	... ..	... ..	+33 23.1	- 11 58.9			
LIMIT	+33 28.1	- 3 14.4	+32 16.6	- 4 08.8	+31 05.8	- 5 01.2	4 29.2		

TOTAL SOLAR ECLIPSE OF 1994 NOVEMBER 3



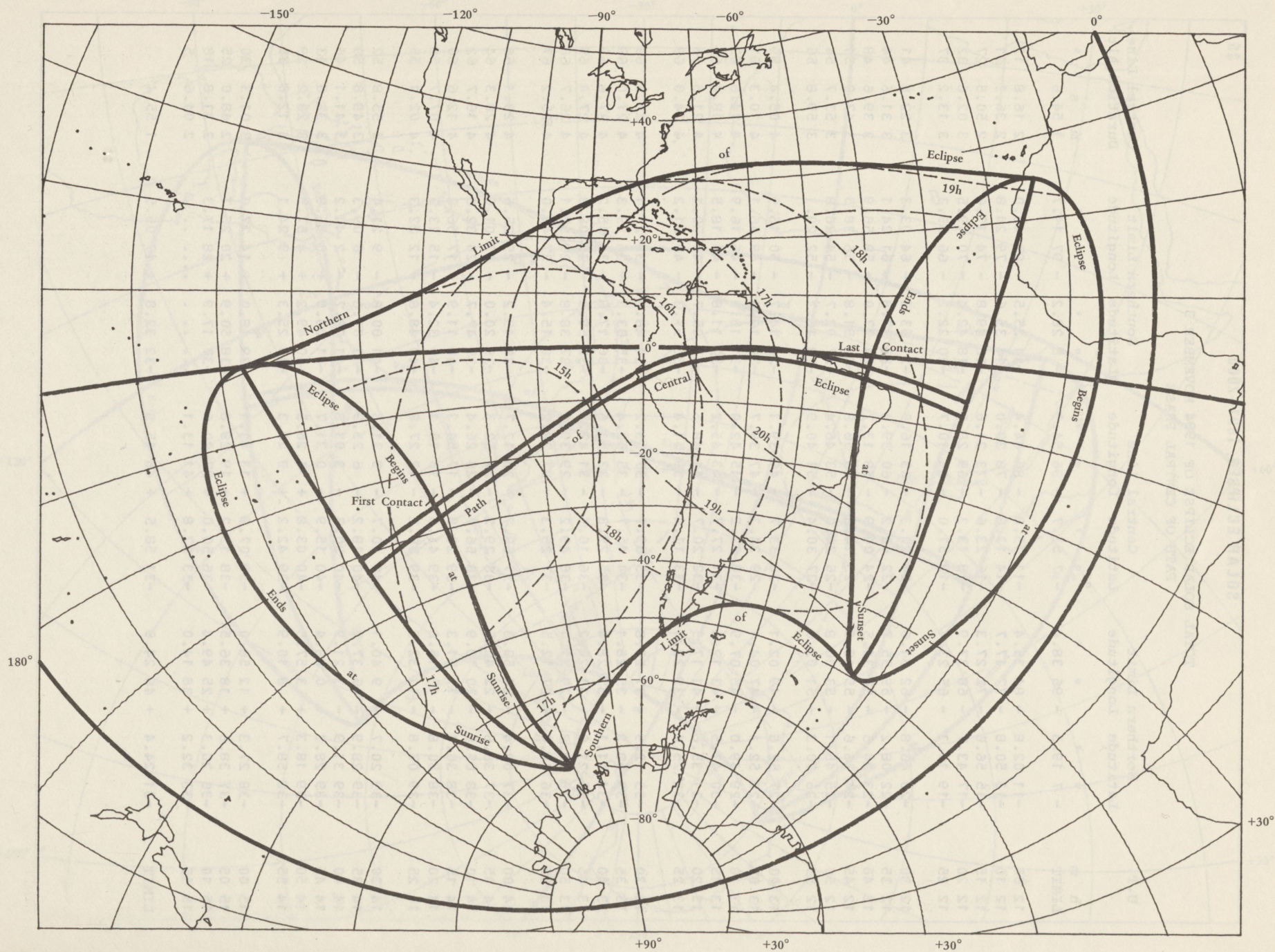
SOLAR ECLIPSES, 1991-2000

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TOTAL SOLAR ECLIPSE OF 1994 NOVEMBER 3
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	
LIMIT	- 7 19.3	- 96 38.4	- 7 53.7	- 96 54.9	- 8 28.2	- 97 11.7	1 54.6	
12 05	-11 02.8	- 84 35.4	-11 15.8	- 86 04.4	-11 25.5	- 87 43.0	2 16.8	12
12 10	-13 50.8	- 77 17.7	-14 13.8	- 78 20.0	-14 35.6	- 79 24.8	2 36.3	21
12 15	-15 56.6	- 72 27.3	-16 23.6	- 73 21.6	-16 49.8	- 74 17.6	2 50.5	27
12 20	-17 43.7	- 68 37.9	-18 13.3	- 69 28.0	-18 42.4	- 70 19.5	3 02.6	32
12 25	-19 19.3	- 65 23.4	-19 51.0	- 66 10.7	-20 22.2	- 66 59.3	3 13.2	37
12 30	-20 46.8	- 62 31.6	-21 20.3	- 63 16.9	-21 53.3	- 64 03.3	3 22.8	41
12 35	-22 08.2	- 59 55.7	-22 43.2	- 60 39.4	-23 17.8	- 61 24.1	3 31.6	44
12 40	-23 24.5	- 57 31.5	-24 00.9	- 58 13.7	-24 37.0	- 58 56.9	3 39.6	48
12 45	-24 36.6	- 55 15.9	-25 14.3	- 55 56.8	-25 51.8	- 56 38.5	3 47.0	51
12 50	-25 45.1	- 53 06.8	-26 24.0	- 53 46.4	-27 02.7	- 54 26.8	3 53.7	54
12 55	-26 50.3	- 51 02.6	-27 30.4	- 51 40.9	-28 10.2	- 52 20.1	3 59.8	56
13 00	-27 52.6	- 49 02.1	-28 33.7	- 49 39.1	-29 14.7	- 50 16.9	4 05.4	59
13 05	-28 52.1	- 47 04.1	-29 34.3	- 47 39.7	-30 16.3	- 48 16.1	4 10.3	61
13 10	-29 49.0	- 45 07.9	-30 32.2	- 45 42.0	-31 15.3	- 46 16.9	4 14.6	63
13 15	-30 43.5	- 43 12.5	-31 27.7	- 43 45.2	-32 11.8	- 44 18.5	4 18.4	65
13 20	-31 35.6	- 41 17.5	-32 20.7	- 41 48.5	-33 05.7	- 42 20.1	4 21.5	66
13 25	-32 25.4	- 39 22.1	-33 11.4	- 39 51.4	-33 57.3	- 40 21.2	4 24.0	68
13 30	-33 12.9	- 37 25.8	-33 59.7	- 37 53.2	-34 46.5	- 38 21.1	4 25.8	69
13 35	-33 58.2	- 35 28.1	-34 45.7	- 35 53.4	-35 33.3	- 36 19.3	4 27.0	69
13 40	-34 41.1	- 33 28.4	-35 29.3	- 33 51.6	-36 17.6	- 34 15.2	4 27.6	69
13 45	-35 21.6	- 31 26.2	-36 10.5	- 31 47.1	-36 59.5	- 32 08.3	4 27.4	69
13 50	-35 59.8	- 29 21.1	-36 49.2	- 29 39.5	-37 38.8	- 29 58.1	4 26.7	68
13 55	-36 35.4	- 27 12.5	-37 25.3	- 27 28.2	-38 15.4	- 27 44.0	4 25.2	67
14 00	-37 08.4	- 24 59.8	-37 58.7	- 25 12.7	-38 49.2	- 25 25.5	4 23.1	66
14 05	-37 38.6	- 22 42.5	-38 29.2	- 22 52.3	-39 20.0	- 23 01.9	4 20.3	64
14 10	-38 05.9	- 20 19.9	-38 56.7	- 20 26.4	-39 47.7	- 20 32.6	4 16.7	62
14 15	-38 30.1	- 17 51.3	-39 20.9	- 17 54.3	-40 11.9	- 17 56.8	4 12.6	60
14 20	-38 50.8	- 15 15.8	-39 41.5	- 15 15.1	-40 32.4	- 15 13.7	4 07.7	58
14 25	-39 07.8	- 12 32.5	-39 58.2	- 12 27.8	-40 48.8	- 12 22.3	4 02.1	55
14 30	-39 20.7	- 9 40.1	-40 10.7	- 9 31.3	-41 00.8	- 9 21.4	3 55.8	52
14 35	-39 28.9	- 6 37.2	-40 18.2	- 6 23.9	-41 07.6	- 6 09.3	3 48.8	50
14 40	-39 31.9	- 3 21.9	-40 20.3	- 3 03.8	-41 08.7	- 2 44.2	3 41.1	46
14 45	-39 28.7	+ 0 08.4	-40 15.9	+ 0 31.7	-41 03.0	+ 0 56.8	3 32.6	43
14 50	-39 18.3	+ 3 57.5	-40 03.8	+ 4 26.5	-40 49.2	+ 4 57.5	3 23.2	39
14 55	-38 58.7	+ 8 10.9	-39 42.2	+ 8 46.3	-40 25.3	+ 9 24.1	3 12.8	35
15 00	-38 27.3	+ 12 58.0	-39 07.9	+ 13 41.1	-39 48.0	+ 14 27.0	3 01.3	30
15 05	-37 38.6	+ 18 36.5	-38 15.2	+ 19 29.8	-38 50.9	+ 20 26.7	2 48.0	25
15 10	-36 20.3	+ 25 49.4	-36 50.0	+ 27 00.6	-37 17.9	+ 28 17.3	2 31.8	18
15 15	-33 32.2	+ 38 14.0	-33 27.8	+ 41 13.1	...	...	2 04.6	5
LIMIT	-31 24.4	+ 46 24.9	-31 58.5	+ 46 45.0	-32 32.8	+ 47 05.5	1 55.4	

ANNULAR SOLAR ECLIPSE OF 1995 APRIL 29



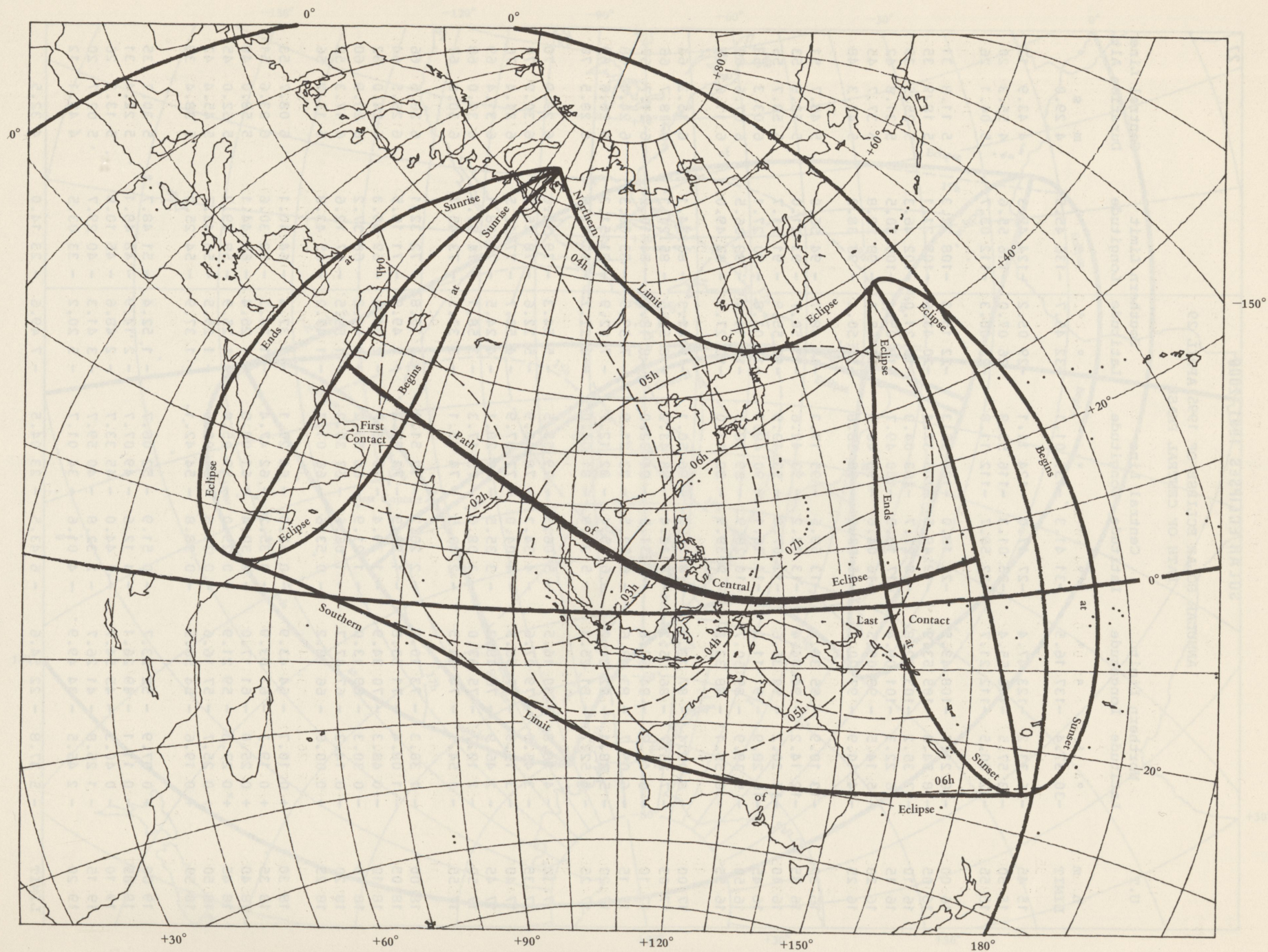
SOLAR ECLIPSES, 1991-2000

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ANNULAR SOLAR ECLIPSE OF 1995 APRIL 29
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s °	
LIMIT	-30 37.4	-137 16.5	-31 41.3	-137 01.1	-32 45.7	-136 45.5	4 29.0	
15 45	-26 33.2	-123 47.4	-27 47.0	-124 11.1	-29 05.2	-124 45.3	4 43.9	12
15 50	-23 57.5	-116 55.4	-25 01.3	-116 53.9	-26 07.0	-116 55.6	4 55.3	20
15 55	-22 00.5	-112 21.7	-22 59.7	-112 11.8	-24 00.3	-112 03.7	5 04.1	26
16 00	-20 21.7	-108 49.5	-21 18.0	-108 35.3	-22 15.3	-108 22.3	5 11.8	31
16 05	-18 54.3	-105 53.9	-19 48.5	-105 37.1	-20 43.6	-105 21.1	5 18.9	35
16 10	-17 35.2	-103 22.8	-18 27.7	-103 04.3	-19 21.0	-102 46.3	5 25.5	39
16 15	-16 22.3	-101 09.4	-17 13.5	-100 49.7	-18 05.4	-100 30.5	5 31.8	42
16 20	-15 14.5	-99 09.5	-16 04.6	-98 48.9	-16 55.4	-98 28.8	5 37.7	45
16 25	-14 10.9	-97 20.0	-15 00.2	-96 58.8	-15 50.1	-96 38.0	5 43.3	48
16 30	-13 10.9	-95 38.8	-13 59.5	-95 17.3	-14 48.7	-94 56.0	5 48.7	51
16 35	-12 14.2	-94 04.4	-13 02.2	-93 42.6	-13 50.7	-93 21.0	5 53.8	53
16 40	-11 20.2	-92 35.6	-12 07.8	-92 13.5	-12 55.9	-91 51.7	5 58.7	56
16 45	-10 28.9	-91 11.2	-11 16.1	-90 49.1	-12 03.8	-90 27.1	6 03.3	58
16 50	-9 39.9	-89 50.7	-10 26.9	-89 28.5	-11 14.4	-89 06.5	6 07.6	60
16 55	-8 53.1	-88 33.2	-9 39.9	-88 11.0	-10 27.2	-87 49.0	6 11.6	62
17 00	-8 08.4	-87 18.2	-8 55.1	-86 56.1	-9 42.3	-86 34.1	6 15.3	64
17 05	-7 25.7	-86 05.2	-8 12.4	-85 43.2	-8 59.6	-85 21.3	6 18.7	66
17 10	-6 44.8	-84 53.8	-7 31.5	-84 32.0	-8 18.8	-84 10.2	6 21.7	67
17 15	-6 05.7	-83 43.6	-6 52.5	-83 21.9	-7 39.9	-83 00.3	6 24.4	68
17 20	-5 28.4	-82 34.2	-6 15.4	-82 12.7	-7 02.9	-81 51.3	6 26.6	69
17 25	-4 52.7	-81 25.3	-5 39.9	-81 04.0	-6 27.7	-80 42.9	6 28.5	70
17 30	-4 18.8	-80 16.5	-5 06.3	-79 55.5	-5 54.3	-79 34.6	6 29.9	70
17 35	-3 46.5	-79 07.6	-4 34.3	-78 46.9	-5 22.6	-78 26.3	6 30.9	70
17 40	-3 15.9	-77 58.3	-4 04.0	-77 37.9	-4 52.7	-77 17.5	6 31.4	70
17 45	-2 46.9	-76 48.2	-3 35.5	-76 28.1	-4 24.5	-76 08.1	6 31.4	69
17 50	-2 19.7	-75 37.0	-3 08.6	-75 17.3	-3 58.1	-74 57.6	6 31.0	68
17 55	-1 54.1	-74 24.5	-2 43.5	-74 05.1	-3 33.5	-73 45.7	6 30.0	67
18 00	-1 30.3	-73 10.2	-2 20.3	-72 51.2	-3 10.8	-72 32.1	6 28.5	66
18 05	-1 08.4	-71 53.8	-1 58.9	-71 35.2	-2 49.9	-71 16.5	6 26.5	64
18 10	-0 48.3	-70 34.9	-1 39.4	-70 16.7	-2 31.0	-69 58.3	6 24.0	62
18 15	-0 30.3	-69 13.0	-1 21.9	-68 55.2	-2 14.2	-68 37.2	6 20.9	60
18 20	-0 14.3	-67 47.7	-1 06.6	-67 30.2	-1 59.5	-67 12.6	6 17.3	58
18 25	-0 00.6	-66 18.2	-0 53.6	-66 01.1	-1 47.2	-65 43.8	6 13.2	56
18 30	+ 0 10.7	-64 43.9	-0 43.0	-64 27.1	-1 37.4	-64 10.1	6 08.7	53
18 35	+ 0 19.3	-63 03.9	-0 35.2	-62 47.4	-1 30.3	-62 30.6	6 03.6	51
18 40	+ 0 25.0	-61 17.0	-0 30.4	-61 00.8	-1 26.4	-60 44.1	5 58.0	48
18 45	+ 0 27.3	-59 21.9	-0 29.0	-59 05.8	-1 25.9	-58 49.2	5 52.0	45
18 50	+ 0 25.7	-57 16.6	-0 31.6	-57 00.5	-1 29.5	-56 43.7	5 45.4	42
18 55	+ 0 19.6	-54 58.5	-0 38.8	-54 42.1	-1 37.9	-54 25.0	5 38.4	39
19 00	+ 0 07.9	-52 23.7	-0 51.9	-52 06.7	-1 52.4	-51 48.7	5 30.7	35
19 05	-0 11.1	-49 26.1	-1 12.6	-49 07.7	-2 14.9	-48 48.1	5 22.4	31
19 10	-0 40.3	-45 54.7	-1 44.0	-45 33.7	-2 48.6	-45 10.9	5 13.2	26
19 15	-1 25.8	-41 26.7	-2 32.8	-40 59.7	-3 41.3	-40 29.7	5 02.7	20
19 20	-2 46.5	-34 49.9	-4 01.6	-34 01.7	-5 20.2	-33 03.5	4 49.1	12
LIMIT	-5 37.8	-22 54.6	-6 43.5	-23 04.5	-7 49.6	-23 14.0	4 32.5	

TOTAL SOLAR ECLIPSE OF 1995 OCTOBER 24



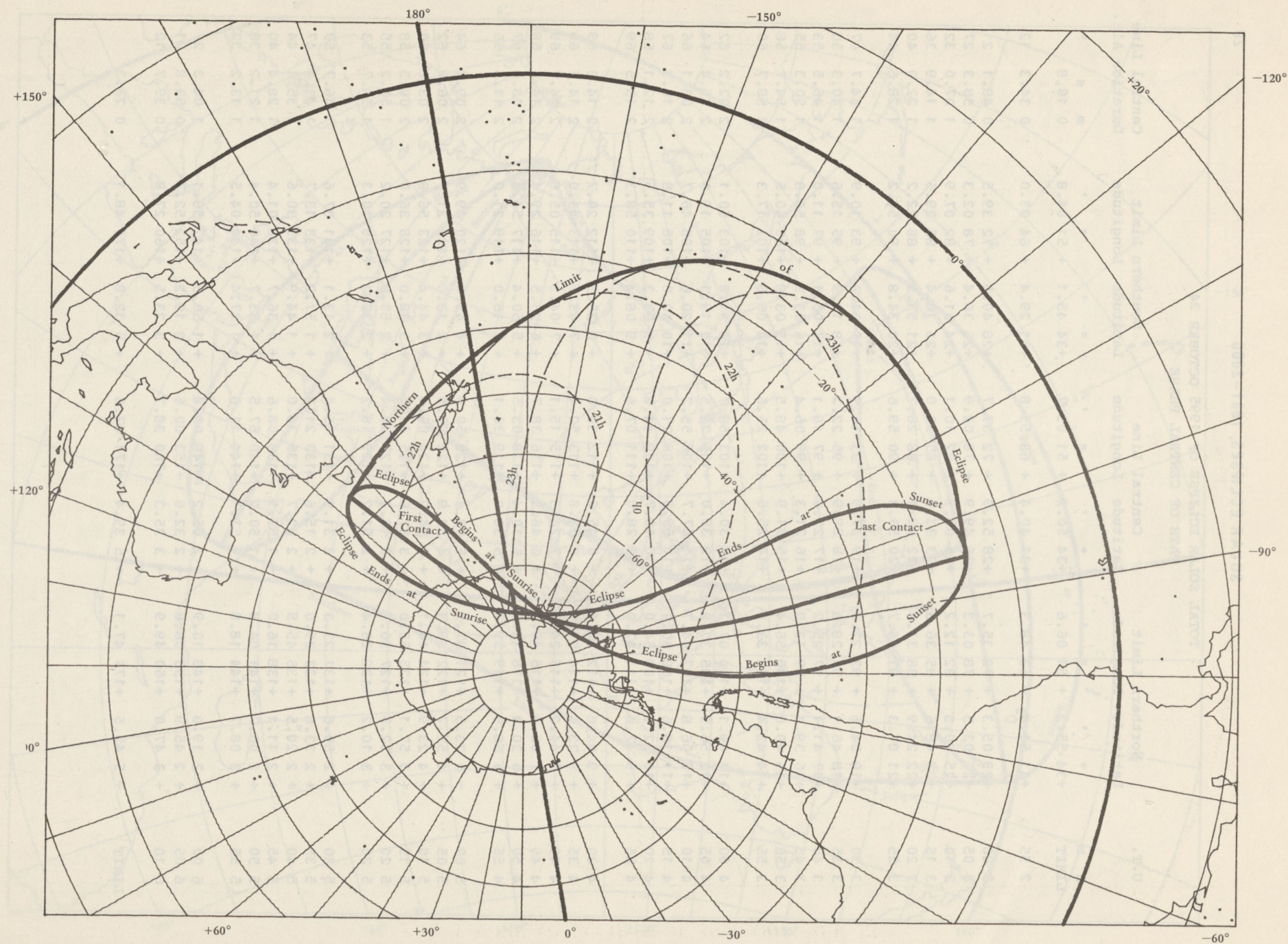
SOLAR ECLIPSES, 1991-2000

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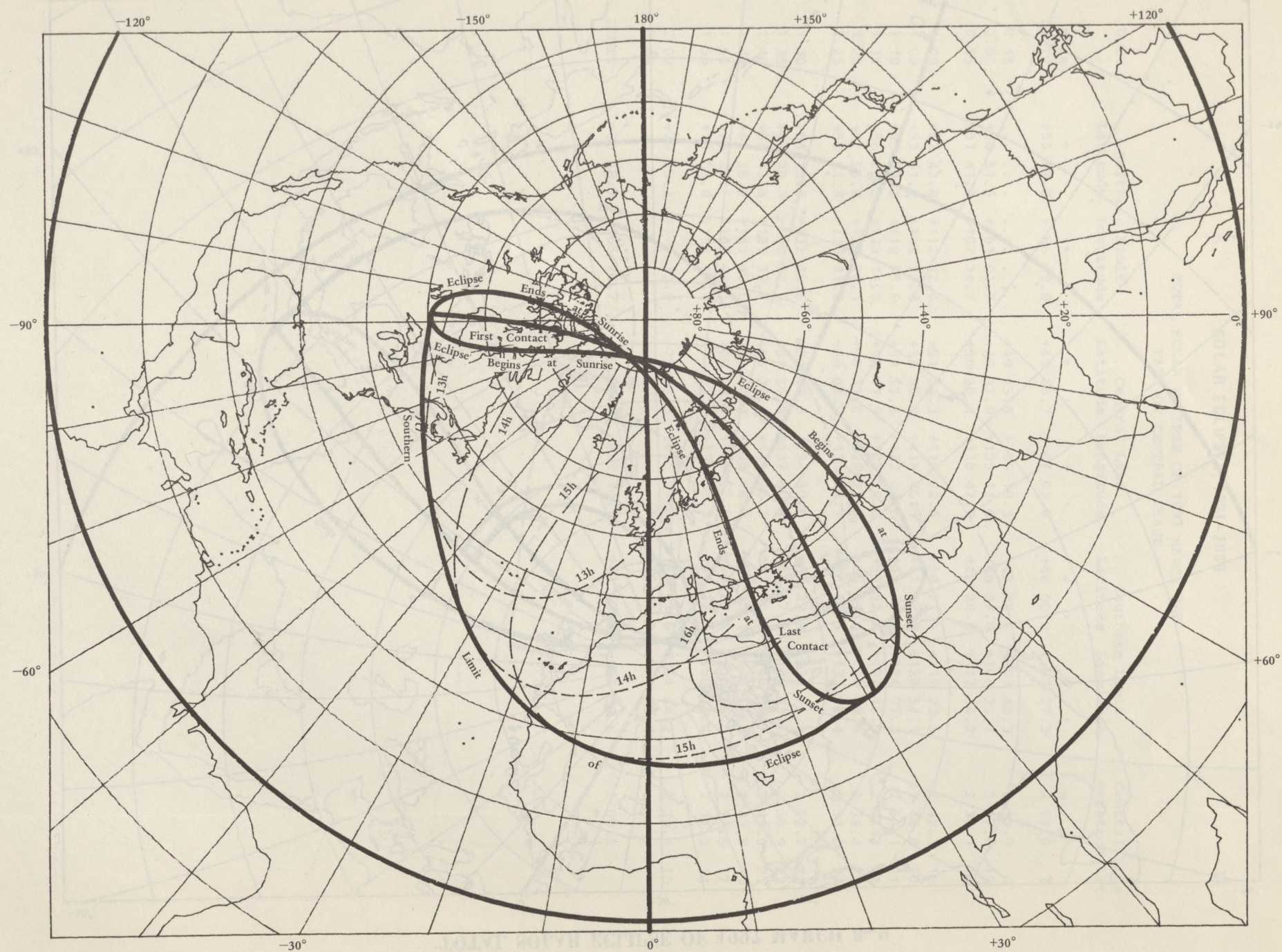
TOTAL SOLAR ECLIPSE OF 1995 OCTOBER 24
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line		
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.	
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "		
LIMIT	+34 55.2	+ 51 06.6	+34 50.2	+ 51 05.7	+34 45.1	+ 51 04.8	0 18.8		
2 55	+31 51.4	+ 63 48.3	+31 40.4	+ 63 55.8	+31 29.4	+ 64 03.0	0 34.3	12	
3 00	+29 05.3	+ 72 35.7	+28 52.9	+ 72 37.7	+28 40.5	+ 72 39.5	0 48.1	21	
3 05	+27 03.5	+ 78 03.3	+26 49.9	+ 78 02.9	+26 36.4	+ 78 02.3	0 58.3	27	
3 10	+25 20.3	+ 82 12.2	+25 05.9	+ 82 10.1	+24 51.6	+ 82 07.9	1 07.0	32	
3 15	+23 48.6	+ 85 36.3	+23 33.5	+ 85 33.0	+23 18.4	+ 85 29.5	1 14.9	36	
3 20	+22 24.9	+ 88 31.0	+22 09.1	+ 88 26.7	+21 53.5	+ 88 22.2	1 22.0	40	
3 25	+21 07.3	+ 91 04.7	+20 51.0	+ 90 59.6	+20 34.8	+ 90 54.2	1 28.6	44	
3 30	+19 54.6	+ 93 22.8	+19 37.9	+ 93 16.9	+19 21.3	+ 93 10.9	1 34.7	47	
3 35	+18 46.1	+ 95 28.8	+18 28.9	+ 95 22.3	+18 11.9	+ 95 15.6	1 40.3	50	
3 40	+17 41.1	+ 97 25.2	+17 23.6	+ 97 18.1	+17 06.1	+ 97 11.0	1 45.5	53	
3 45	+16 39.1	+ 99 13.9	+16 21.3	+ 99 06.4	+16 03.5	+ 98 58.8	1 50.3	55	
3 50	+15 40.0	+100 56.4	+15 21.9	+100 48.5	+15 03.8	+100 40.5	1 54.7	58	
3 55	+14 43.4	+102 33.8	+14 25.0	+102 25.6	+14 06.6	+102 17.3	1 58.7	60	
4 00	+13 49.1	+104 07.2	+13 30.4	+103 58.7	+13 11.8	+103 50.1	2 02.2	62	
4 05	+12 56.9	+105 37.2	+12 38.0	+105 28.5	+12 19.1	+105 19.6	2 05.4	64	
4 10	+12 06.8	+107 04.7	+11 47.7	+106 55.7	+11 28.6	+106 46.7	2 08.1	66	
4 15	+11 18.6	+108 30.1	+10 59.3	+108 21.0	+10 40.0	+108 11.8	2 10.3	67	
4 20	+10 32.2	+109 54.0	+10 12.7	+109 44.8	+ 9 53.3	+109 35.5	2 12.1	68	
4 25	+ 9 47.6	+111 17.0	+ 9 28.0	+111 07.6	+ 9 08.4	+110 58.3	2 13.5	69	
4 30	+ 9 04.8	+112 39.4	+ 8 45.0	+112 30.0	+ 8 25.3	+112 20.7	2 14.3	69	
4 35	+ 8 23.6	+114 01.8	+ 8 03.8	+113 52.4	+ 7 43.9	+113 43.0	2 14.7	69	
4 40	+ 7 44.2	+115 24.5	+ 7 24.3	+115 15.1	+ 7 04.3	+115 05.8	2 14.7	69	
4 45	+ 7 06.4	+116 48.0	+ 6 46.5	+116 38.7	+ 6 26.5	+116 29.4	2 14.1	68	
4 50	+ 6 30.4	+118 12.8	+ 6 10.4	+118 03.5	+ 5 50.4	+117 54.3	2 13.0	67	
4 55	+ 5 56.0	+119 39.2	+ 5 36.0	+119 30.1	+ 5 16.0	+119 21.0	2 11.5	66	
5 00	+ 5 23.5	+121 07.9	+ 5 03.5	+120 58.9	+ 4 43.6	+120 49.9	2 09.4	64	
5 05	+ 4 52.7	+122 39.3	+ 4 32.9	+122 30.5	+ 4 13.0	+122 21.7	2 06.8	62	
5 10	+ 4 23.9	+124 14.1	+ 4 04.2	+124 05.4	+ 3 44.4	+123 56.8	2 03.8	60	
5 15	+ 3 57.1	+125 53.0	+ 3 37.6	+125 44.5	+ 3 18.0	+125 36.0	2 00.3	58	
5 20	+ 3 32.5	+127 36.7	+ 3 13.2	+127 28.4	+ 2 53.8	+127 20.2	1 56.2	55	
5 25	+ 3 10.2	+129 26.4	+ 2 51.2	+129 18.3	+ 2 32.1	+129 10.3	1 51.7	53	
5 30	+ 2 50.6	+131 23.3	+ 2 31.9	+131 15.4	+ 2 13.1	+131 07.6	1 46.7	50	
5 35	+ 2 33.8	+133 29.0	+ 2 15.6	+133 21.3	+ 1 57.2	+133 13.7	1 41.1	47	
5 40	+ 2 20.5	+135 45.5	+ 2 02.7	+135 38.0	+ 1 44.9	+135 30.6	1 35.1	44	
5 45	+ 2 11.1	+138 16.0	+ 1 53.9	+138 08.6	+ 1 36.7	+138 01.4	1 28.4	40	
5 50	+ 2 06.7	+141 04.8	+ 1 50.2	+140 57.5	+ 1 33.7	+140 50.4	1 21.2	36	
5 55	+ 2 08.7	+144 18.8	+ 1 53.1	+144 11.6	+ 1 37.4	+144 04.5	1 13.2	32	
6 00	+ 2 19.8	+148 10.9	+ 2 05.2	+148 03.4	+ 1 50.5	+147 56.1	1 04.3	27	
6 05	+ 2 45.9	+153 08.8	+ 2 32.6	+153 00.6	+ 2 19.2	+152 52.7	0 53.8	21	
6 10	+ 3 47.0	+160 49.9	+ 3 35.3	+160 38.7	+ 3 23.5	+160 27.8	0 39.7	12	
LIMIT	+ 5 45.5	+171 47.1	+ 5 39.1	+171 47.6	+ 5 32.8	+171 48.1	0 23.3		

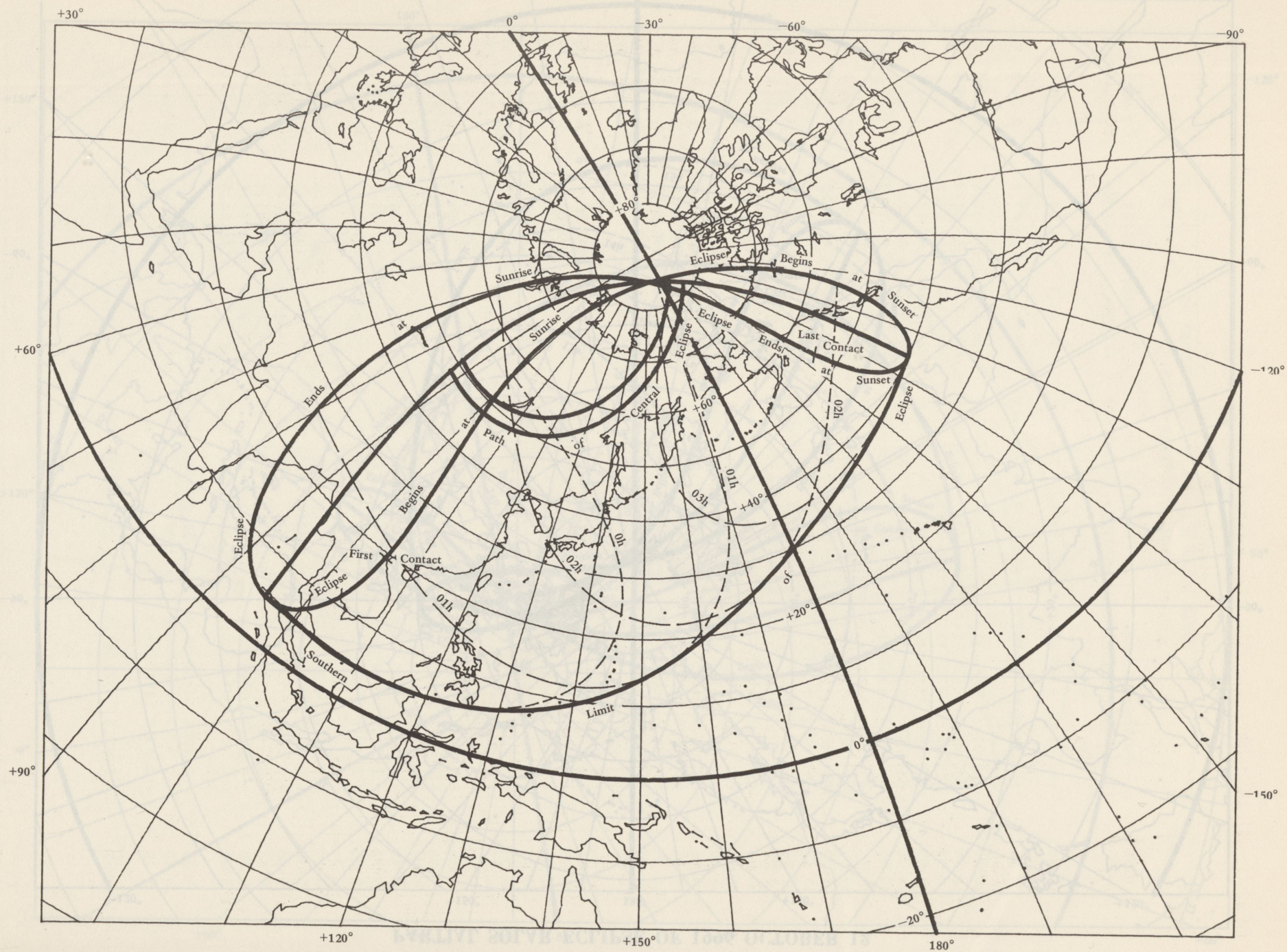
PARTIAL SOLAR ECLIPSE OF 1996 APRIL 17-18



PARTIAL SOLAR ECLIPSE OF 1996 OCTOBER 12



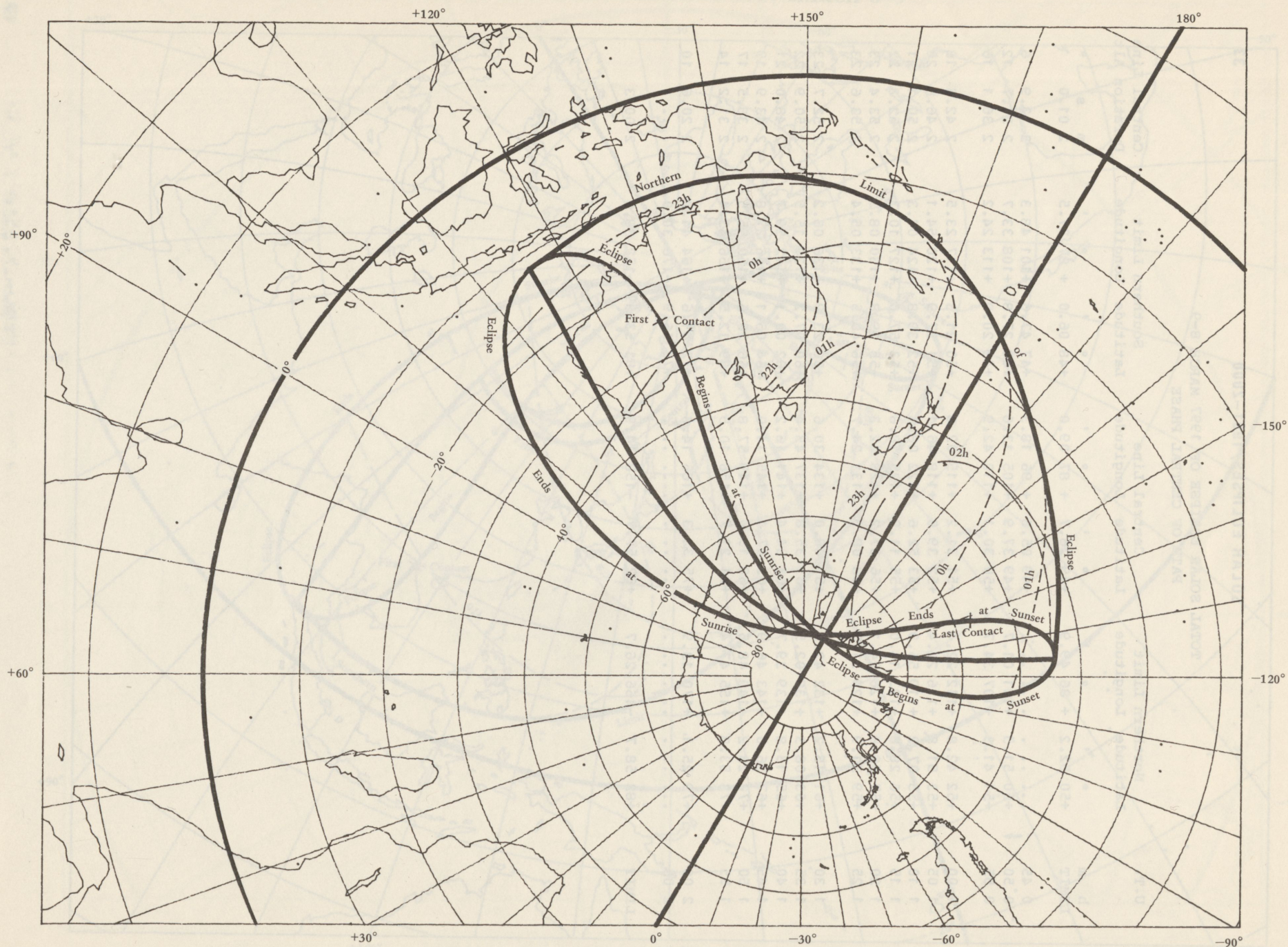
TOTAL SOLAR ECLIPSE OF 1997 MARCH 8-9



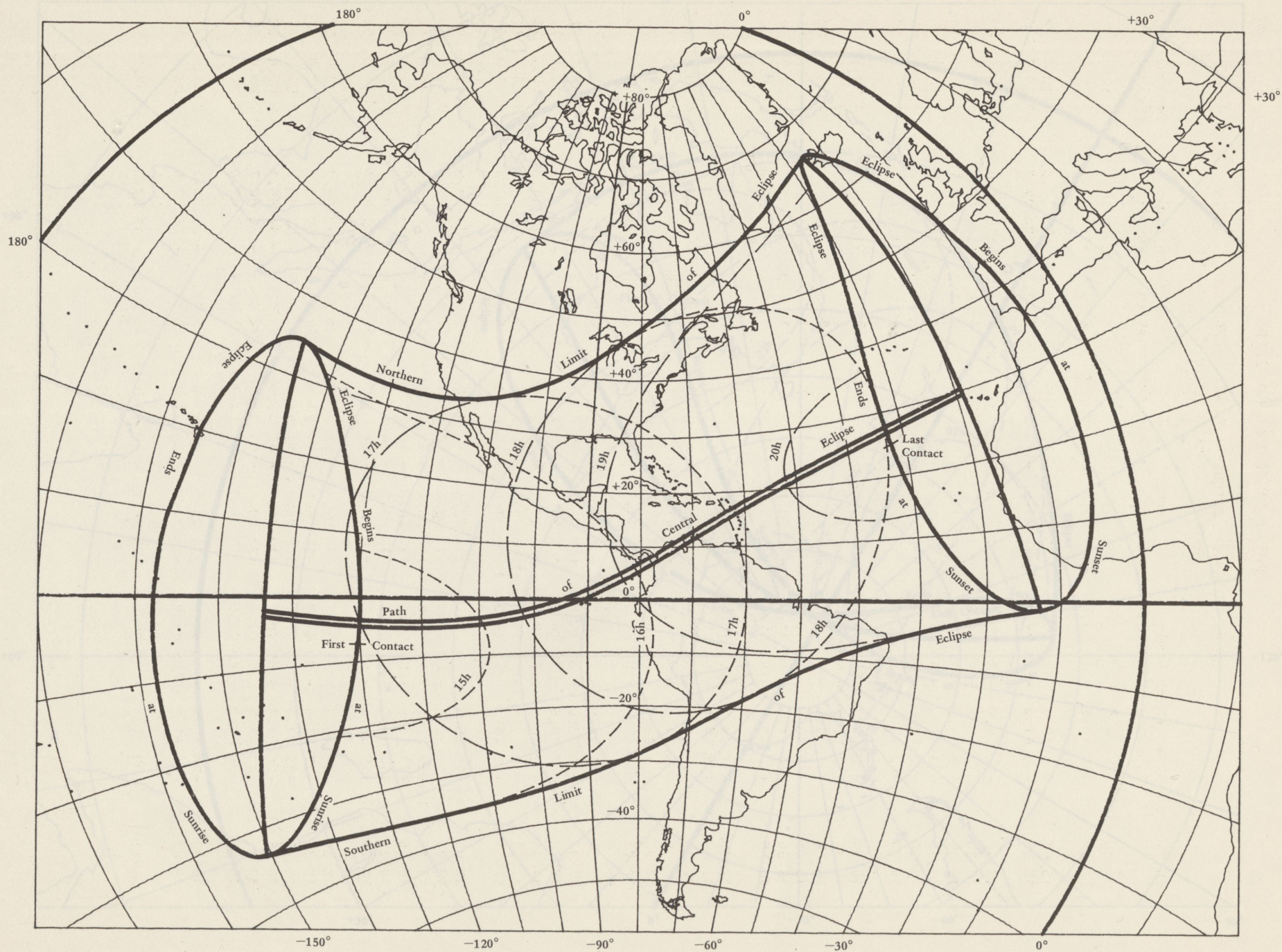
TOTAL SOLAR ECLIPSE OF 1997 MARCH 8-9
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	
LIMIT	+50 52.2	+ 86 49.9	+49 26.7	+ 87 09.0	+48 06.0	+ 87 27.5	2 01.0	
0 45	... ..	.... ..	+49 05.6	+ 96 18.3	+47 47.6	+101 48.3	2 13.9	6
0 50	+50 51.5	+101 01.7	+49 37.9	+105 13.6	+48 27.8	+108 33.7	2 27.7	12
0 55	+51 41.3	+107 34.7	+50 30.1	+110 42.9	+49 20.8	+113 24.2	2 36.1	16
1 00	+52 42.8	+112 22.4	+51 31.2	+115 02.6	+50 21.3	+117 23.5	2 42.3	18
1 05	+53 51.8	+116 22.4	+52 39.0	+118 46.1	+51 27.9	+120 54.1	2 46.8	20
1 10	+55 07.2	+119 55.9	+53 52.6	+122 08.6	+52 39.8	+124 07.3	2 50.1	21
1 15	+56 28.8	+123 14.0	+55 11.9	+125 18.6	+53 57.0	+127 10.3	2 52.3	22
1 20	+57 56.8	+126 24.1	+56 37.2	+128 22.3	+55 19.8	+130 08.2	2 53.4	23
1 25	+59 31.9	+129 31.8	+58 08.9	+131 24.7	+56 48.5	+133 05.4	2 53.6	23
1 30	+61 15.2	+132 42.6	+59 48.0	+134 30.6	+58 23.9	+136 06.2	2 52.7	23
1 35	+63 08.3	+136 02.5	+61 35.8	+137 45.4	+60 07.2	+139 15.5	2 50.9	22
1 40	+65 13.8	+139 39.7	+63 34.4	+141 16.2	+62 00.1	+142 39.7	2 48.0	21
1 45	+67 36.0	+143 46.9	+65 47.1	+145 14.0	+64 05.1	+146 27.8	2 43.9	19
1 50	+70 23.2	+148 48.5	+68 19.6	+149 57.8	+66 26.6	+150 55.5	2 38.5	17
1 55	+73 53.8	+155 47.4	+71 23.7	+156 10.5	+69 12.5	+156 33.4	2 31.2	14
2 00	+79 25.1	+170 13.9	+75 32.3	+166 14.6	+72 41.6	+164 44.2	2 20.6	10
2 05	... ..	.... ..	... ..	.... ..	+78 16.9	-176 30.0	. . .	
LIMIT	+83 58.7	-166 26.7	+82 57.7	-158 14.9	+81 53.3	-152 38.6	2 00.3	

PARTIAL SOLAR ECLIPSE OF 1997 SEPTEMBER 1-2



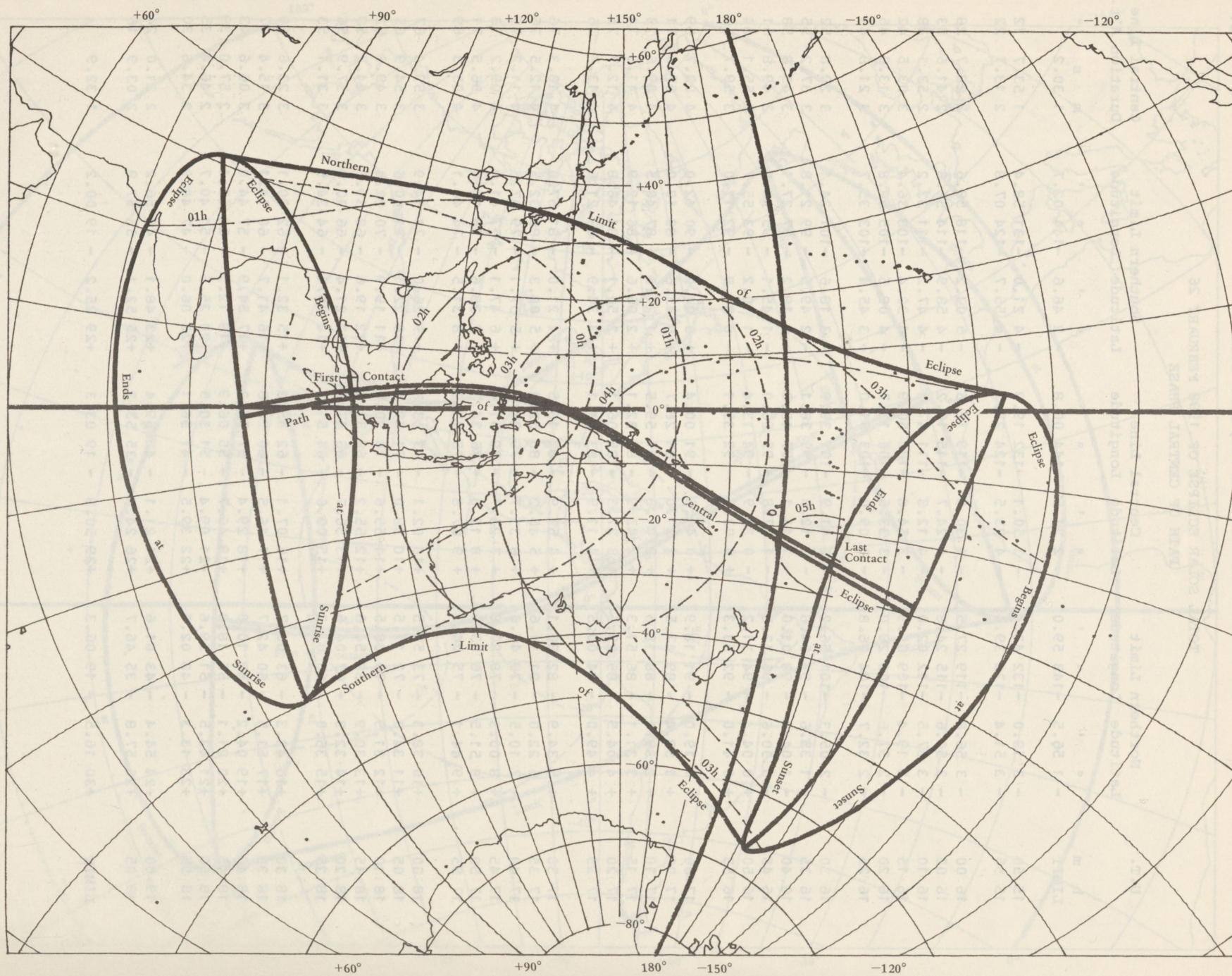
TOTAL SOLAR ECLIPSE OF 1998 FEBRUARY 26



TOTAL SOLAR ECLIPSE OF 1998 FEBRUARY 26
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line		
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.	
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "		
LIMIT	- 1 56.5	-143 59.0	- 2 21.6	-144 00.8	- 2 46.6	-144 02.7	1 30.2		
15 50	- 3 19.0	-132 43.4	- 3 50.1	-132 19.9	- 4 21.0	-131 58.4	1 53.7	12	
15 55	- 3 51.4	-124 39.4	- 4 23.5	-124 23.1	- 4 55.7	-124 07.8	2 13.7	22	
16 00	- 3 56.8	-119 27.5	- 4 30.0	-119 12.6	- 5 03.2	-118 58.6	2 28.7	28	
16 05	- 3 50.6	-115 24.8	- 4 24.7	-115 10.2	- 4 58.9	-114 56.3	2 41.6	33	
16 10	- 3 37.5	-112 02.0	- 4 12.3	-111 47.3	- 4 47.2	-111 33.2	2 53.1	38	
16 15	- 3 19.4	-109 05.9	- 3 54.8	-108 50.9	- 4 30.4	-108 36.4	3 03.5	42	
16 20	- 2 57.6	-106 29.0	- 3 33.5	-106 13.7	- 4 09.5	-105 58.8	3 13.0	46	
16 25	- 2 32.7	-104 06.8	- 3 09.0	-103 51.0	- 3 45.4	-103 35.7	3 21.8	49	
16 30	- 2 05.3	-101 56.2	- 2 41.9	-101 39.9	- 3 18.6	-101 24.1	3 29.8	52	
16 35	- 1 35.6	- 99 54.8	- 2 12.5	- 99 38.1	- 2 49.5	- 99 21.8	3 37.2	55	
16 40	- 1 04.0	- 98 01.0	- 1 41.1	- 97 43.9	- 2 18.2	- 97 27.1	3 43.8	58	
16 45	- 0 30.6	- 96 13.5	- 1 07.8	- 95 56.0	- 1 45.1	- 95 38.8	3 49.8	61	
16 50	+ 0 04.4	- 94 31.2	- 0 32.9	- 94 13.4	- 1 10.2	- 93 55.7	3 55.1	64	
16 55	+ 0 41.0	- 92 53.3	+ 0 03.6	- 92 35.1	- 0 33.8	- 92 17.0	3 59.7	66	
17 00	+ 1 19.0	- 91 18.9	+ 0 41.6	- 91 00.4	+ 0 04.2	- 90 42.0	4 03.7	69	
17 05	+ 1 58.4	- 89 47.5	+ 1 21.0	- 89 28.7	+ 0 43.6	- 89 10.0	4 07.0	71	
17 10	+ 2 39.1	- 88 18.5	+ 2 01.8	- 87 59.5	+ 1 24.5	- 87 40.5	4 09.6	73	
17 15	+ 3 21.1	- 86 51.3	+ 2 43.9	- 86 32.1	+ 2 06.6	- 86 12.9	4 11.5	74	
17 20	+ 4 04.5	- 85 25.5	+ 3 27.3	- 85 06.1	+ 2 50.1	- 84 46.8	4 12.7	75	
17 25	+ 4 49.0	- 84 00.5	+ 4 14.9	- 83 41.1	+ 3 34.9	- 83 21.6	4 13.3	76	
17 30	+ 5 34.9	- 82 36.1	+ 4 57.9	- 82 16.5	+ 4 21.0	- 81 57.0	4 13.3	76	
17 35	+ 6 22.0	- 81 11.6	+ 5 45.2	- 80 52.0	+ 5 08.3	- 80 32.5	4 12.5	76	
17 40	+ 7 10.5	- 79 46.6	+ 6 33.7	- 79 27.2	+ 5 57.1	- 79 07.6	4 11.2	75	
17 45	+ 8 00.3	- 78 20.8	+ 7 23.7	- 78 01.4	+ 6 47.1	- 77 41.9	4 09.2	73	
17 50	+ 8 51.5	- 76 53.5	+ 8 15.0	- 76 34.3	+ 7 38.6	- 76 14.9	4 06.5	71	
17 55	+ 9 44.1	- 75 24.3	+ 9 07.8	- 75 05.3	+ 8 31.5	- 74 46.1	4 03.3	69	
18 00	+10 38.3	- 73 52.5	+10 02.1	- 73 33.8	+ 9 26.0	- 73 14.9	3 59.4	67	
18 05	+11 34.0	- 72 17.5	+10 58.0	- 71 59.1	+10 22.1	- 71 40.6	3 54.9	65	
18 10	+12 31.5	- 70 38.5	+11 55.6	- 70 20.6	+11 19.9	- 70 02.4	3 49.9	62	
18 15	+13 30.9	- 68 54.6	+12 55.2	- 68 37.2	+12 19.6	- 68 19.5	3 44.2	59	
18 20	+14 32.3	- 67 04.6	+13 56.7	- 66 47.8	+13 21.4	- 66 30.8	3 37.9	56	
18 25	+15 36.0	- 65 07.2	+15 00.6	- 64 51.2	+14 25.4	- 64 34.9	3 31.1	53	
18 30	+16 42.3	- 63 00.7	+16 07.1	- 62 45.6	+15 32.1	- 62 30.1	3 23.6	50	
18 35	+17 51.5	- 60 42.7	+17 16.5	- 60 28.6	+16 41.7	- 60 14.1	3 15.4	47	
18 40	+19 04.2	- 58 10.0	+18 29.4	- 57 57.2	+17 54.9	- 57 44.0	3 06.6	43	
18 45	+20 21.1	- 55 18.0	+19 46.7	- 55 06.9	+19 12.5	- 54 55.1	2 57.0	39	
18 50	+21 43.5	- 51 59.6	+21 09.4	- 51 50.5	+20 35.5	- 51 40.7	2 46.4	35	
18 55	+23 13.3	- 48 02.5	+22 39.5	- 47 56.1	+22 06.0	- 47 48.9	2 34.6	30	
19 00	+24 54.4	- 43 01.6	+24 21.1	- 42 59.4	+23 48.1	- 42 56.2	2 21.0	24	
19 05	+26 57.8	- 35 46.7	+26 24.8	- 35 53.2	+25 52.1	- 35 57.9	2 03.9	16	
LIMIT	+30 16.5	- 19 06.3	+29 50.8	- 19 03.3	+29 25.2	- 19 00.2	1 32.9		

ANNULAR SOLAR ECLIPSE OF 1998 AUGUST 21-22



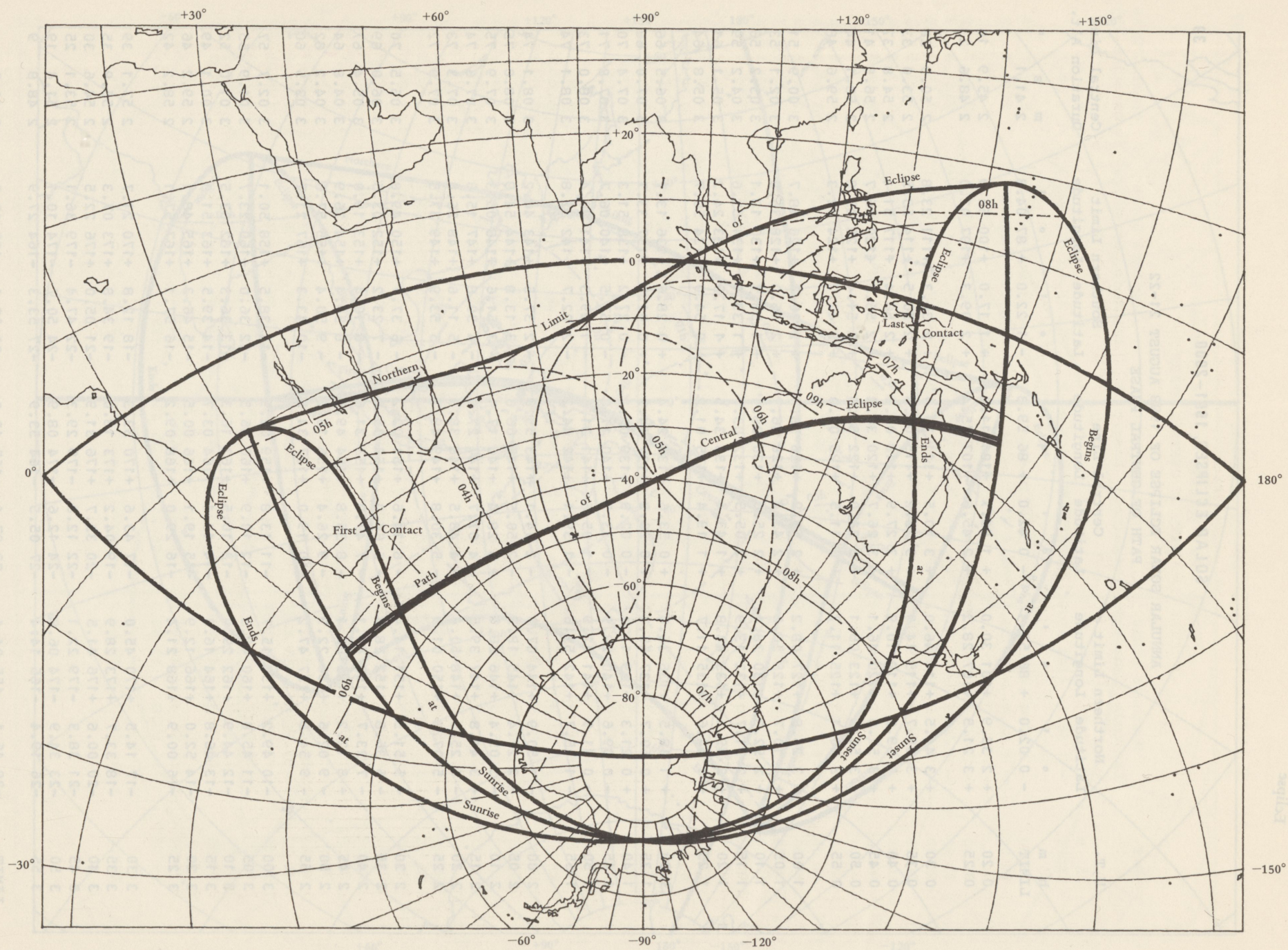
SOLAR ECLIPSES, 1991-2000

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ANNULAR SOLAR ECLIPSE OF 1998 AUGUST 21-22
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	
LIMIT	- 0 02.0	+ 86 54.1	- 0 42.0	+ 86 59.3	- 1 22.0	+ 87 04.3	2 41.1	
0 20	+ 2 35.9	+101 30.0	+ 1 56.7	+101 11.6	+ 1 17.0	+100 51.9	2 45.9	16
0 25	+ 3 21.5	+107 28.2	+ 2 45.6	+107 15.4	+ 2 09.3	+107 02.0	2 48.6	23
0 30	+ 3 44.5	+111 46.0	+ 3 10.5	+111 35.1	+ 2 36.3	+111 23.8	2 50.9	28
0 35	+ 3 55.7	+115 14.0	+ 3 23.2	+115 03.8	+ 2 50.5	+114 53.5	2 53.0	33
0 40	+ 3 59.2	+118 10.9	+ 3 27.9	+118 01.1	+ 2 56.4	+117 51.1	2 54.8	37
0 45	+ 3 57.0	+120 46.1	+ 3 26.7	+120 36.4	+ 2 56.2	+120 26.7	2 56.5	41
0 50	+ 3 50.4	+123 05.1	+ 3 21.0	+122 55.5	+ 2 51.4	+122 45.8	2 58.1	44
0 55	+ 3 40.1	+125 11.7	+ 3 11.5	+125 02.0	+ 2 42.7	+124 52.3	2 59.6	48
1 00	+ 3 26.8	+127 08.2	+ 2 58.9	+126 58.5	+ 2 30.7	+126 48.7	3 00.9	51
1 05	+ 3 10.7	+128 56.6	+ 2 43.4	+128 46.7	+ 2 16.0	+128 36.8	3 02.1	53
1 10	+ 2 52.3	+130 38.1	+ 2 25.6	+130 28.1	+ 1 58.7	+130 18.1	3 03.2	56
1 15	+ 2 31.7	+132 13.9	+ 2 05.5	+132 03.7	+ 1 39.1	+131 53.6	3 04.2	59
1 20	+ 2 09.1	+133 44.8	+ 1 43.4	+133 34.5	+ 1 17.5	+133 24.2	3 05.1	61
1 25	+ 1 44.6	+135 11.7	+ 1 19.4	+135 01.2	+ 0 54.0	+134 50.7	3 05.8	64
1 30	+ 1 18.5	+136 35.0	+ 0 53.6	+136 24.4	+ 0 28.6	+136 13.7	3 06.5	66
1 35	+ 0 50.7	+137 55.3	+ 0 26.2	+137 44.5	+ 0 01.5	+137 33.7	3 07.0	68
1 40	+ 0 21.3	+139 13.1	- 0 02.9	+139 02.2	- 0 27.2	+138 51.3	3 07.4	70
1 45	- 0 09.6	+140 28.9	- 0 33.5	+140 17.8	- 0 57.5	+140 06.7	3 07.8	71
1 50	- 0 41.9	+141 42.9	- 1 05.6	+141 31.7	- 1 29.3	+141 20.4	3 08.0	73
1 55	- 1 15.7	+142 55.6	- 1 39.1	+142 44.2	- 2 02.7	+142 32.8	3 08.1	74
2 00	- 1 50.9	+144 07.3	- 2 14.1	+143 55.8	- 2 37.5	+143 44.2	3 08.1	74
2 05	- 2 27.4	+145 18.3	- 2 50.5	+145 06.6	- 3 13.8	+144 54.9	3 08.0	75
2 10	- 3 05.4	+146 28.9	- 3 28.4	+146 17.1	- 3 51.6	+146 05.3	3 07.9	75
2 15	- 3 44.8	+147 39.5	- 4 07.7	+147 27.6	- 4 30.8	+147 15.6	3 07.6	74
2 20	- 4 25.5	+148 50.4	- 4 48.5	+148 38.3	- 5 11.6	+148 26.3	3 07.3	73
2 25	- 5 07.8	+150 01.9	- 5 30.8	+149 49.7	- 5 53.9	+149 37.5	3 07.0	72
2 30	- 5 51.5	+151 14.4	- 6 14.6	+151 02.2	- 6 37.7	+150 49.8	3 06.5	70
2 35	- 6 36.8	+152 28.4	- 6 60.0	+152 15.9	- 7 23.2	+152 03.5	3 06.0	69
2 40	- 7 23.7	+153 44.1	- 7 47.0	+153 31.6	- 8 10.4	+153 19.0	3 05.4	67
2 45	- 8 12.2	+155 02.1	- 8 35.8	+154 49.5	- 8 59.4	+154 36.9	3 04.8	64
2 50	- 9 02.6	+156 22.9	- 9 26.4	+156 10.2	- 9 50.4	+155 57.6	3 04.2	62
2 55	- 9 54.8	+157 47.2	-10 19.0	+157 34.5	-10 43.3	+157 21.7	3 03.5	60
3 00	-10 49.2	+159 15.7	-11 13.8	+159 02.9	-11 38.5	+158 50.1	3 02.7	57
3 05	-11 45.8	+160 49.3	-12 10.9	+160 36.5	-12 36.0	+160 23.7	3 01.9	55
3 10	-12 44.9	+162 29.0	-13 10.5	+162 16.3	-13 36.3	+162 03.5	3 01.0	52
3 15	-13 46.8	+164 16.3	-14 13.1	+164 03.7	-14 39.5	+163 51.0	3 00.1	49
3 20	-14 52.0	+166 12.9	-15 19.1	+166 00.5	-15 46.3	+165 48.1	2 59.2	46
3 25	-16 00.9	+168 21.4	-16 29.0	+168 09.2	-16 57.1	+167 57.1	2 58.2	42
3 30	-17 14.5	+170 45.0	-17 43.6	+170 33.3	-18 12.8	+170 21.7	2 57.1	39
3 35	-18 33.7	+173 28.9	-19 04.2	+173 18.0	-19 34.8	+173 07.3	2 55.9	35
3 40	-20 00.6	+176 41.5	-20 32.7	+176 31.9	-21 05.0	+176 22.5	2 54.6	30
3 45	-21 38.5	-179 22.1	-22 12.8	-179 29.3	-22 47.4	-179 36.1	2 53.1	25
3 50	-23 34.9	-174 06.8	-24 12.6	-174 08.9	-24 50.7	-174 10.1	2 51.4	19
3 55	-26 19.4	-165 14.4	-27 05.5	-164 53.9	-27 53.3	-164 27.9	2 48.8	9
LIMIT	-28 46.1	-155 04.1	-29 27.1	-155 12.0	-30 08.1	-155 19.9	2 46.5	

ANNULAR SOLAR ECLIPSE OF 1999 FEBRUARY 16



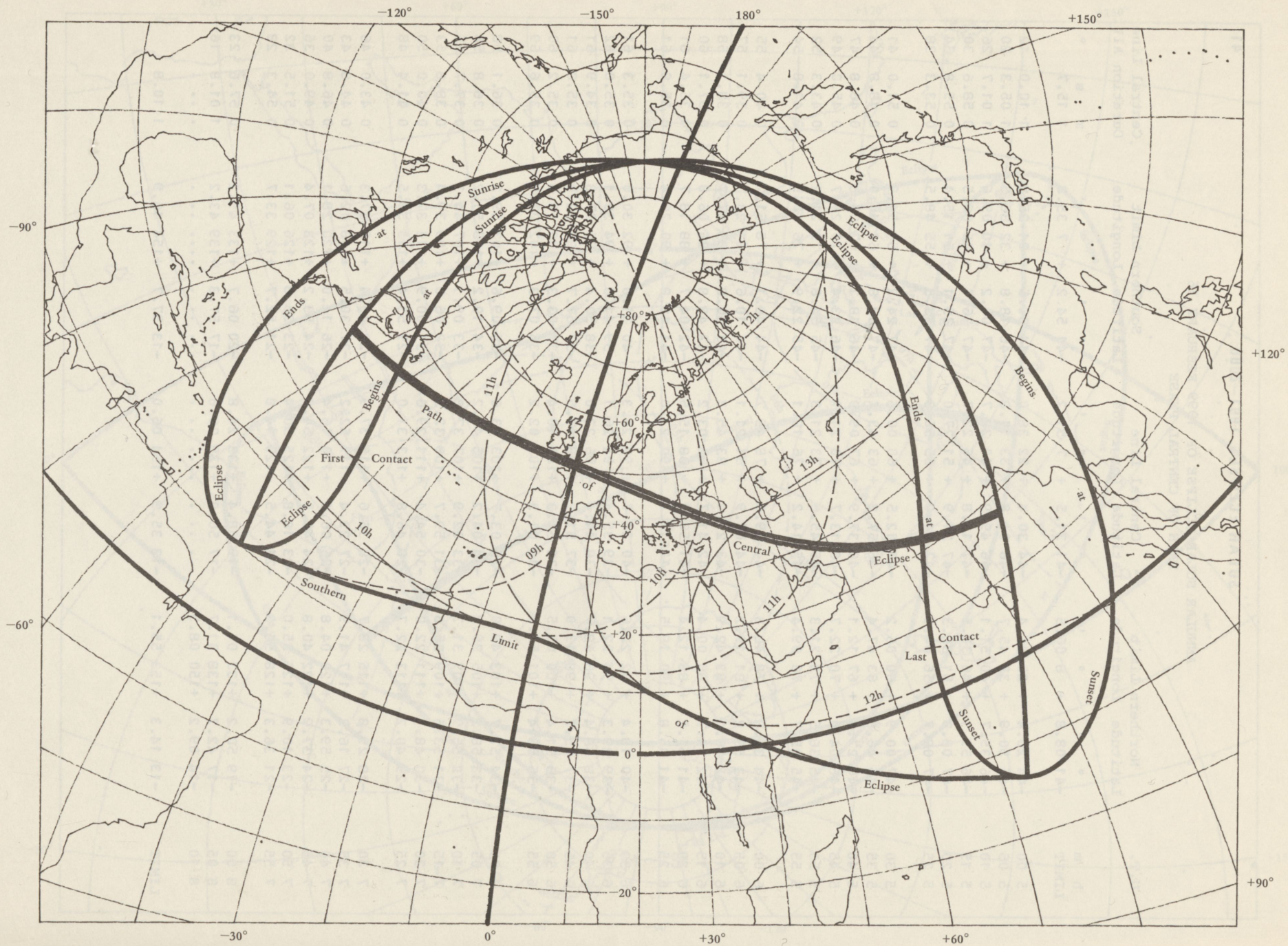
SOLAR ECLIPSES, 1991-2000

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ANNULAR SOLAR ECLIPSE OF 1999 FEBRUARY 16
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	°	'	°	'	°	'	m	s °
LIMIT	-41 08.8	+ 8 06.5	-41 31.5	+ 7 51.2	-41 54.2	+ 7 35.8	1 15.7	
5 00	-44 20.4	+ 23 43.4	-44 30.4	+ 22 38.0	-44 39.5	+ 21 25.8	1 10.0	12
5 05	-45 50.9	+ 33 45.7	-46 04.8	+ 33 11.8	-46 18.8	+ 32 36.5	1 05.3	20
5 10	-46 35.7	+ 40 51.1	-46 49.9	+ 40 28.7	-47 04.2	+ 40 05.6	1 01.7	26
5 15	-46 59.1	+ 46 38.5	-47 12.8	+ 46 22.7	-47 26.7	+ 46 06.5	0 58.6	30
5 20	-47 08.8	+ 51 38.3	-47 21.9	+ 51 27.0	-47 35.1	+ 51 15.4	0 55.8	34
5 25	-47 08.7	+ 56 04.9	-47 21.0	+ 55 56.8	-47 33.5	+ 55 48.5	0 53.3	38
5 30	-47 00.9	+ 60 06.2	-47 12.5	+ 60 00.6	-47 24.2	+ 59 54.9	0 51.0	41
5 35	-46 46.8	+ 63 47.4	-46 57.8	+ 63 43.7	-47 08.8	+ 63 40.0	0 48.8	44
5 40	-46 27.6	+ 67 12.1	-46 37.9	+ 67 09.9	-46 48.2	+ 67 07.6	0 46.8	47
5 45	-46 04.0	+ 70 22.7	-46 13.7	+ 70 21.7	-46 23.4	+ 70 20.7	0 45.0	49
5 50	-45 36.5	+ 73 21.3	-45 45.6	+ 73 21.3	-45 54.8	+ 73 21.2	0 43.3	52
5 55	-45 05.7	+ 76 09.4	-45 14.2	+ 76 10.1	-45 22.9	+ 76 10.9	0 41.8	54
6 00	-44 31.8	+ 78 48.3	-44 39.9	+ 78 49.7	-44 48.1	+ 78 51.2	0 40.4	55
6 05	-43 55.2	+ 81 19.2	-44 02.9	+ 81 21.1	-44 10.6	+ 81 23.1	0 39.1	57
6 10	-43 16.1	+ 83 42.9	-43 23.4	+ 83 45.3	-43 30.8	+ 83 47.7	0 38.1	58
6 15	-42 34.7	+ 86 00.4	-42 41.7	+ 86 03.2	-42 48.8	+ 86 06.0	0 37.1	60
6 20	-41 51.2	+ 88 12.4	-41 58.0	+ 88 15.5	-42 04.7	+ 88 18.7	0 36.4	61
6 25	-41 05.8	+ 90 19.5	-41 12.3	+ 90 23.0	-41 18.8	+ 90 26.4	0 35.8	61
6 30	-40 18.4	+ 92 22.6	-40 24.7	+ 92 26.3	-40 31.0	+ 92 30.0	0 35.3	61
6 35	-39 29.3	+ 94 22.1	-39 35.4	+ 94 26.1	-39 41.6	+ 94 30.1	0 35.0	62
6 40	-38 38.4	+ 96 18.7	-38 44.4	+ 96 23.0	-38 50.4	+ 96 27.3	0 34.9	61
6 45	-37 45.7	+ 98 13.0	-37 51.7	+ 98 17.5	-37 57.7	+ 98 22.1	0 35.0	61
6 50	-36 51.4	+100 05.5	-36 57.3	+100 10.4	-37 03.3	+100 15.3	0 35.2	60
6 55	-35 55.4	+101 57.0	-36 01.3	+102 02.2	-36 07.3	+102 07.5	0 35.6	59
7 00	-34 57.7	+103 48.0	-35 03.7	+103 53.6	-35 09.6	+103 59.2	0 36.1	58
7 05	-33 58.2	+105 39.2	-34 04.2	+105 45.2	-34 10.2	+105 51.2	0 36.8	56
7 10	-32 56.9	+107 31.3	-33 02.9	+107 37.8	-33 09.1	+107 44.3	0 37.7	55
7 15	-31 53.5	+109 25.3	-31 59.7	+109 32.3	-32 06.0	+109 39.4	0 38.8	53
7 20	-30 48.1	+111 22.0	-30 54.4	+111 29.6	-31 00.9	+111 37.3	0 40.0	50
7 25	-29 40.2	+113 22.7	-29 46.8	+113 31.0	-29 53.4	+113 39.5	0 41.4	48
7 30	-28 29.8	+115 28.7	-28 36.6	+115 37.9	-28 43.4	+115 47.3	0 43.0	46
7 35	-27 16.3	+117 41.9	-27 23.4	+117 52.2	-27 30.5	+118 02.6	0 44.8	43
7 40	-25 59.3	+120 04.8	-26 06.6	+120 16.4	-26 14.0	+120 28.1	0 46.8	40
7 45	-24 37.9	+122 40.8	-24 45.5	+122 54.0	-24 53.2	+123 07.4	0 49.0	36
7 50	-23 10.9	+125 35.0	-23 18.8	+125 50.4	-23 26.8	+126 06.1	0 51.5	32
7 55	-21 36.3	+128 56.3	-21 44.5	+129 14.8	-21 52.7	+129 33.7	0 54.3	28
8 00	-19 50.2	+133 01.1	-19 58.4	+133 24.8	-20 06.7	+133 49.2	0 57.6	23
8 05	-17 42.7	+138 31.7	-17 50.0	+139 06.6	-17 57.3	+139 43.2	1 01.8	16
8 10	-14 09.2	+150 08.5	...	...	...	...	...	...
LIMIT	-13 14.3	+153 55.1	-13 35.9	+154 06.0	-13 57.7	+154 16.9	1 10.8	

TOTAL SOLAR ECLIPSE OF 1999 AUGUST 11



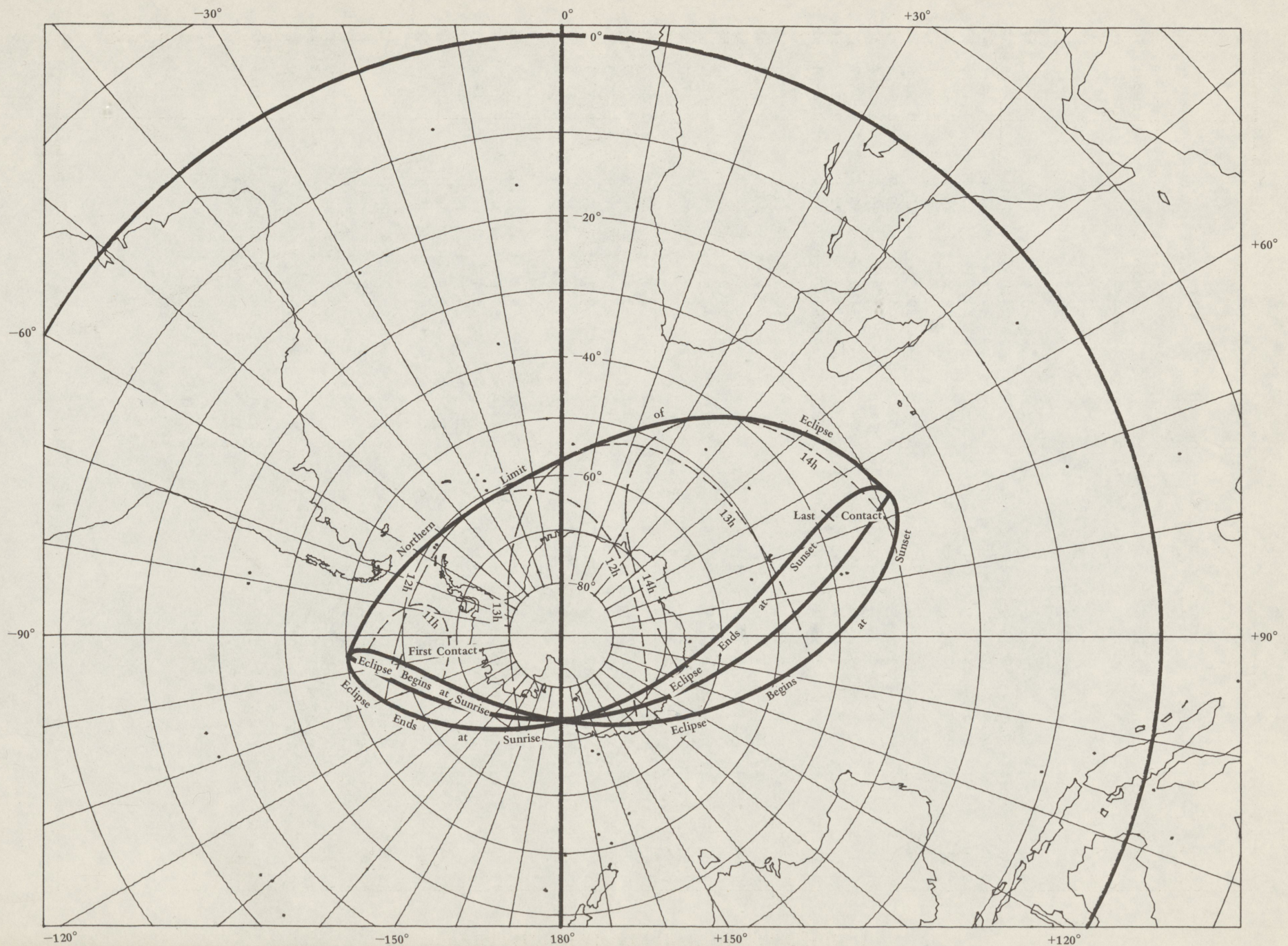
SOLAR ECLIPSES, 1991-2000

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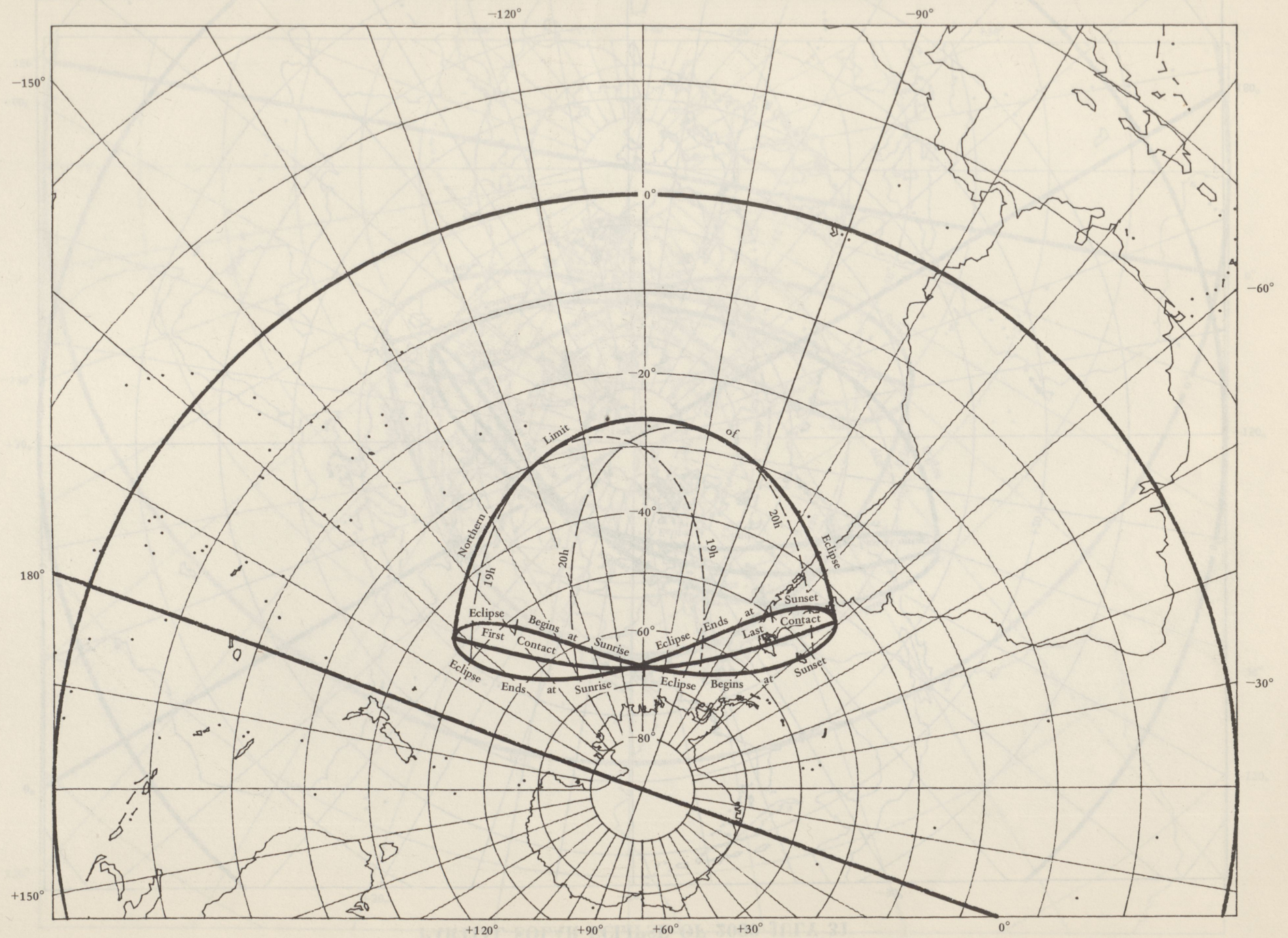
TOTAL SOLAR ECLIPSE OF 1999 AUGUST 11
PATH OF CENTRAL PHASE

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	m s "	
LIMIT	+41 16.9	- 65 17.7	+41 01.7	- 65 05.5	+40 46.5	- 64 53.5	0 49.2	
9 35	+46 07.4	- 46 45.6	+45 57.6	- 45 44.6	+45 46.9	- 44 45.8	1 12.2	16
9 40	+47 57.3	- 37 49.6	+47 40.9	- 37 02.7	+47 23.8	- 36 17.2	1 23.6	22
9 45	+49 04.4	- 31 00.1	+48 44.0	- 30 20.7	+48 23.3	- 29 42.6	1 32.7	28
9 50	+49 48.4	- 25 12.6	+49 25.3	- 24 39.2	+49 01.9	- 24 06.9	1 40.5	32
9 55	+50 16.8	- 20 04.5	+49 51.6	- 19 36.2	+49 26.2	- 19 08.9	1 47.5	36
10 00	+50 33.4	- 15 24.4	+50 06.6	- 15 00.9	+49 39.6	- 14 38.3	1 53.6	39
10 05	+50 40.7	- 11 06.2	+50 12.6	- 10 47.2	+49 44.4	- 10 28.9	1 59.2	42
10 10	+50 40.0	- 7 05.7	+50 11.0	- 6 51.0	+49 41.8	- 6 36.8	2 04.2	45
10 15	+50 32.7	- 3 20.3	+50 02.9	- 3 09.5	+49 33.0	- 2 59.4	2 08.7	47
10 20	+50 19.4	+ 0 12.2	+49 49.1	+ 0 19.1	+49 18.8	+ 0 25.5	2 12.7	50
10 25	+50 01.0	+ 3 33.2	+49 30.4	+ 3 36.5	+48 59.7	+ 3 39.4	2 16.1	52
10 30	+49 37.9	+ 6 44.0	+49 07.1	+ 6 43.8	+48 36.3	+ 6 43.5	2 19.1	53
10 35	+49 10.5	+ 9 45.6	+48 39.8	+ 9 42.3	+48 09.0	+ 9 38.8	2 21.7	55
10 40	+48 39.4	+ 12 38.9	+48 08.7	+ 12 32.6	+47 38.1	+ 12 26.3	2 23.7	56
10 45	+48 04.6	+ 15 24.9	+47 34.2	+ 15 15.8	+47 03.8	+ 15 06.8	2 25.3	58
10 50	+47 26.7	+ 18 04.1	+46 56.6	+ 17 52.5	+46 26.5	+ 17 41.0	2 26.4	58
10 55	+46 45.6	+ 20 37.3	+46 16.0	+ 20 23.4	+45 46.3	+ 20 09.7	2 27.1	59
11 00	+46 01.6	+ 23 05.3	+45 32.5	+ 22 49.2	+45 03.4	+ 22 33.4	2 27.2	59
11 05	+45 15.0	+ 25 28.6	+44 46.4	+ 25 10.6	+44 17.8	+ 24 52.9	2 27.0	59
11 10	+44 25.6	+ 27 47.9	+43 57.7	+ 27 28.2	+43 29.8	+ 27 08.8	2 26.3	59
11 15	+43 33.7	+ 30 03.9	+43 06.5	+ 29 42.6	+42 39.3	+ 29 21.7	2 25.1	59
11 20	+42 39.3	+ 32 17.2	+42 12.9	+ 31 54.5	+41 46.3	+ 31 32.2	2 23.5	58
11 25	+41 42.4	+ 34 28.6	+41 16.8	+ 34 04.7	+40 51.0	+ 33 41.1	2 21.5	57
11 30	+40 43.0	+ 36 38.8	+40 18.2	+ 36 13.7	+39 53.2	+ 35 49.0	2 19.0	55
11 35	+39 41.0	+ 38 48.6	+39 17.0	+ 38 22.4	+38 53.0	+ 37 56.7	2 16.1	54
11 40	+38 36.3	+ 40 58.9	+38 13.3	+ 40 31.8	+37 50.1	+ 40 05.1	2 12.8	52
11 45	+37 28.8	+ 43 10.6	+37 06.7	+ 42 42.7	+36 44.5	+ 42 15.1	2 09.1	50
11 50	+36 18.2	+ 45 25.1	+35 57.1	+ 44 56.3	+35 35.9	+ 44 28.0	2 04.9	48
11 55	+35 04.2	+ 47 43.7	+34 44.2	+ 47 14.2	+34 24.0	+ 46 45.1	2 00.4	46
12 00	+33 46.3	+ 50 08.3	+33 27.5	+ 49 38.0	+33 08.5	+ 49 08.2	1 55.3	43
12 05	+32 24.1	+ 52 41.3	+32 06.5	+ 52 10.2	+31 48.6	+ 51 39.6	1 49.8	40
12 10	+30 56.4	+ 55 26.0	+30 40.2	+ 54 54.1	+30 23.7	+ 54 22.6	1 43.7	37
12 15	+29 21.9	+ 58 27.6	+29 07.2	+ 57 54.6	+28 52.2	+ 57 22.0	1 37.0	33
12 20	+27 38.2	+ 61 54.3	+27 25.3	+ 61 19.7	+27 12.1	+ 60 45.6	1 29.6	29
12 25	+25 40.7	+ 66 01.6	+25 30.2	+ 65 24.5	+25 19.3	+ 64 47.9	1 21.0	24
12 30	+23 18.5	+ 71 28.0	+23 11.7	+ 70 45.0	+23 04.3	+ 70 03.0	1 10.6	18
12 35	+19 33.0	+ 81 38.4	+19 40.5	+ 80 16.2	+19 44.9	+ 79 03.2	0 54.7	7
LIMIT	+17 47.5	+ 87 25.1	+17 33.2	+ 87 16.6	+17 18.9	+ 87 08.2	0 45.0	

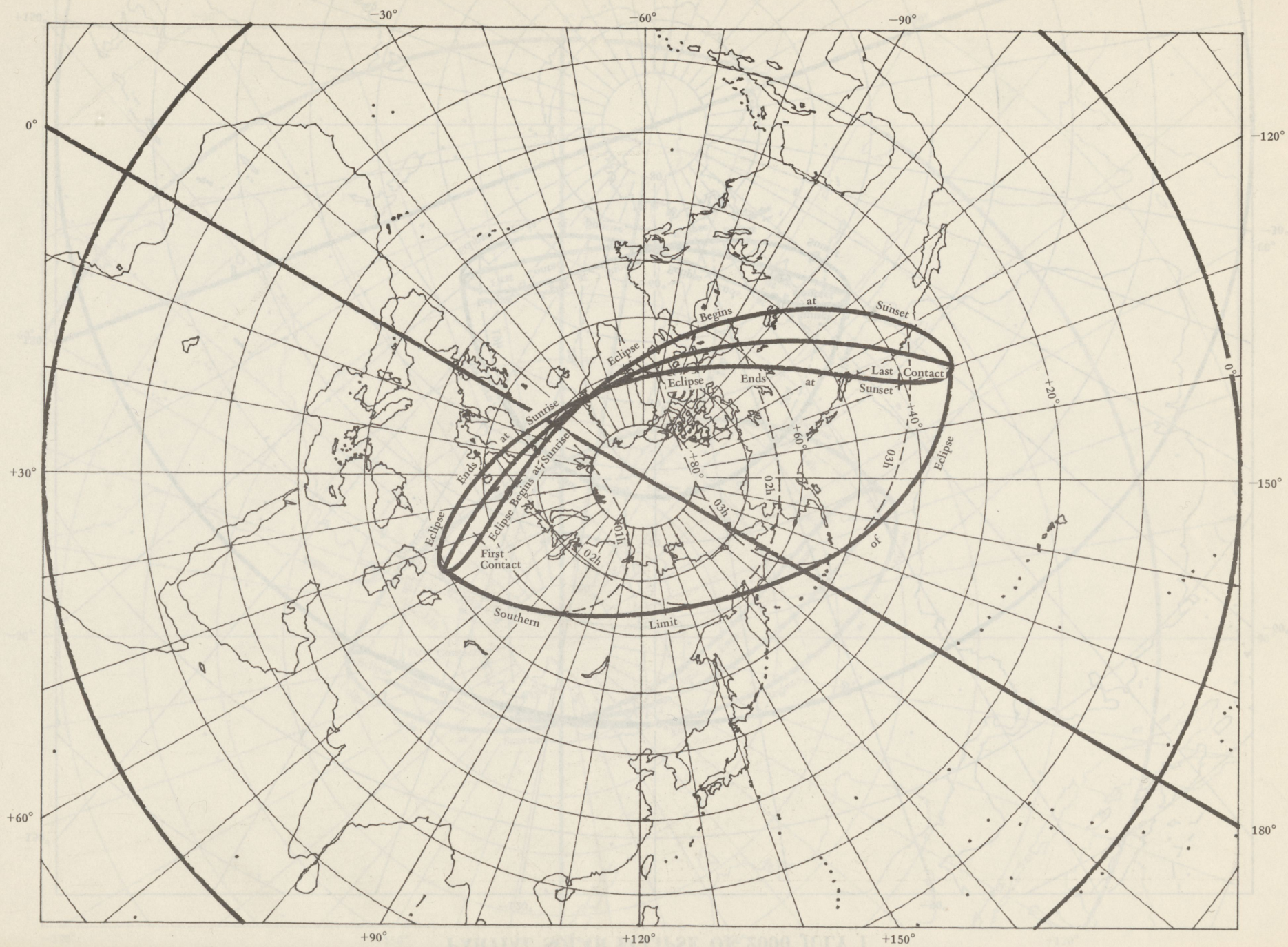
PARTIAL SOLAR ECLIPSE OF 2000 FEBRUARY 5



PARTIAL SOLAR ECLIPSE OF 2000 JULY 1



PARTIAL SOLAR ECLIPSE OF 2000 JULY 31



PARTIAL SOLAR ECLIPSE OF 2000 DECEMBER 25

